U.S. Department of the Interior

Bureau of Land Management

October 2020

Nageezi Units 2309 and 2409 Cluster Oil Wells Projects

Environmental Assessment
DOI-BLM-NM-FO10-2020-0029
Applicant: DJR Operating, LLC
Lease No. NMNM-132981A

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Nageezi Unit 2309 and 2409 Cluster Oil Wells Projects

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1 Introduction

1.1 Summary of Proposed Action

DJR Operating, LLC (DJR), has submitted Applications for Permit to Drill (APDs; Form 3160-3) to the Bureau of Land Management (BLM) Farmington Field Office (FFO) for development of four well pads, associated well-connect pipelines, and between two and five wells per pad located within 2 miles of each other. The four well pads and associated infrastructure are individual projects that are being analyzed in this environmental assessment (EA) as a "cluster project" due to their connected action and will be referred to collectively as the Proposed Action. The Proposed Action is located within DJR's approved Nageezi Unit (NU) (NMNM 132981A). The proposed well pads, access roads, pipelines and temporary work areas are located in the N1/2 of Sections 2 and 3 T23N R9W; NE Section 33, NW Section 34, N1/2 and S1/2 Section 35 of T24N R9W, New Mexico Principal Meridian; San Juan County, New Mexico. The individual well pads ("proposed project(s)") and their well numbers are listed below.

- NU M35-2409 Nos. 314H, 315H, 316H, 318H, and 319H (NU M35)
- NU G35-2409 Nos. 308H, 309H, 310H, 632H, and 313H (NU G35)
- NU B02-2309 Nos. 305H, 306H, 307H, and 622H (NU B02)
- NU H33-2409 Nos. 633H and 608H (NU H33)

The BLM FFO is the lead agency for the Proposed Action because it manages the surface estates associated with the proposed projects, with the exception of the proposed NU G35-2409 pad, which is located on Navajo Allotted surface and managed by the Federal Indian Minerals Office (FIMO). Each well would access both federally managed minerals and FIMO managed minerals permitted by the BLM FFO under approved APDs, with concurrence from the Bureau of Indian Affairs FIMO.

The Proposed Action would involve the construction, use, and final abandonment of four well pads and associated well-connect pipelines, as well as drilling, operation, and plugging between two and five wells per pad for a total of 16 wells. The wells would be horizontally drilled from the proposed pads. The Proposed Action would be located within the boundaries of DJR's NU and would be permitted by the BLM FFO and Bureau of Indian Affairs. Additional well location information is provided in the APDs on file with the BLM. Photographs and maps of the proposed project areas are provided in Appendices D and E, respectively.

1.2 Purpose and Need

The purpose for the proposed project is to considerDJR reasonable access to public and FIMO-managed land to develop their federally managed mineral lease(s) within the approved Nageezi Unit. The purpose is also to provide DJR access to BLM-managed land while protecting the surface resources to the maximum extent possible.

The need for the Proposed Action is established by the BLM's responsibility under the Mineral Leasing Act of 1920, as amended (30 United States Code [USC] 181 et seq.); 43 Code of Federal Regulations (CFR) 3160 (Onshore Oil and Gas Operations), the Act of March 3, 1909 (1909 Act); and the Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.)

1.3 Decision to Be Made

Based on the information detailed in this EA, the BLM FFO will decide whether to approve the APDs, and if so, under what terms and conditions as delineated in any applicable conditions of approval (COAs). The BLM FFO Authorized Officer will decide to do one of the following: approve the APDs with COAs, as submitted; approve the APDs with additional mitigation measures; or deny approval of the APDs.

1.4 Land Use Conformance

The Proposed Action is in conformance with the September 2003 FFO Resource Management Plan (RMP) with Record of Decision, as updated in December 2003 (BLM 2003a). The Proposed Action conforms to the objectives of the RMP, which states the following:

> It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices. At the same time, the BLM strives to ensure that mineral development is carried out in a manner that minimizes environmental damage and provides for the rehabilitation of affected lands. (BLM 2003a:2-2–2-3).

As required by the National Environmental Policy Act (NEPA), this site-specific EA addresses resources and impacts of the Proposed Action that were not specifically addressed within the FFO's Proposed RMP and Final Environmental Impact Statement (PRMP/FEIS) (BLM 2003b). The Proposed Action would not conflict with any local, county, or state plans.

1.5 Relationship to Statutes, Regulations, and Other NEPA Documents

Various federal and state agencies regulate different aspects of oil and gas infrastructure development. Table 1.1 provides a selected listing of relevant permits, regulations, and approvals that could be required for the proposed project (all tables in this EA are also provided in Appendix F).

Table 1.1. Permits, Regulations, and Approvals Relevant to the Proposed Project

Permit/Regulation/Approval	Issuing Agency	Status
Federal Permit, Approval, or Clearance		
APD	BLM	The applications are currently under review by the BLM and are the subject of this EA.
Executive Order (EO) 12898	BLM	Impacts to minority and low-income populations are described in Section 3.8.
Section 7 of the Endangered Species Act	U.S. Fish and Wildlife Service (USFWS)	The proposed project is in conformance with the biological assessment conducted for the RMP (BLM 2002). All fresh water used for pads and road construction and well drilling and completion will be trucked from the Blanco Trading Post Water Well, point of diversion number SJ-2105. No new water depletions are associated with Proposed Action. No further consultation with the USFWS is required.

Permit/Regulation/Approval	Issuing Agency	Status
Federal Noxious Weed Act (Public Law [PL] 93-629; 7 USC 2801 et seq. 88 Statute [Stat.] 2148)	BLM	Natural resource specialists conducted noxious weed surveys within the proposed project areas in July 2018 (NU M35), July 2019 (NU B02), and December 2019 (NU G35 and NU H33). See Table 1.4 for details.
Clean Water Act (CWA) Section 402 General Construction (Stormwater) Permit	U.S. Environmental Protection Agency and New Mexico Environment Department (NMED)	The proposed project is exempt based on the 1987 Water Quality Act and Section 323 of the Energy Policy Act of 2005.
Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703–712)	BLM	The BLM would comply with MBTA pre-construction nesting survey requirements.
Paleontological Resources Preservation Act of 2009 (Sections 6301–6312 of the Omnibus Public Lands Act of 2009, 16 USC 470aaa)	BLM	Table 1.4 describes potential impacts to paleontological resources. Please refer to Table 1.4 for details.
CWA Section 404 Permitting Discharges of Dredge or Fill Material into Waters of the U.S. (including wetlands)	U.S. Army Corps of Engineers	During on-site meetings and natural resources surveys within the proposed project areas, natural resources specialists determined that there would be no impacts to waters of the U.S. Please refer to Table 1.4 for details.
Section 106 of the National Historic Preservation Act	BLM	Table 1.4 describes potential impacts to cultural resources. Any required further consultation with the State Historic Preservation Office would be conducted by the BLM.
State Permit, Approval, or Clearance		
New Mexico EO 00-22 (regarding Noxious Weeds)	New Mexico Department of Agriculture	Natural resources specialists conducted noxious weed surveys within the proposed project areas in July 2018 (NU M35), July 2019 (NU B02), and December 2019 (NU G35 and NU H33). Please refer to Table 1.4 for details.
Clean Air Act New Mexico Air Quality Control Act	NMED	Impacts to air quality are described in Sections 3.1 and 3.2. The Proposed Action would be considered a minor source unit and may be permitted with a General Construction Permit per 20.2.72 New Mexico Administrative Code (NMAC). A notice of intent would need to be filed with NMED.

1.6 Scoping and Issues

1.6.1 Internal Scoping

As part of its review of the proposed project, the BLM FFO Interdisciplinary Team (IDT) conducted internal scoping to identify potentially affected resources and land uses. The IDT meeting was held on February 28, 2020. The IDT Checklist (Appendix G) provides a list of the issues that were considered, along with the rationale for further analysis or dismissal from further analysis in this EA.

1.6.2 External Scoping

The BLM FFO initiated external scoping for the Proposed Action by posting the Proposed Action on the BLM National NEPA Register ePlanning website (BLM 2020a) for a public scoping period beginning on February 27, 2020, which included the BLM's Authorized Officer's contact email and phone number for interested parties. This listing included a description of the Proposed Action and a map of the proposed project area.

External scoping also included giving interested parties an opportunity to attend the BLM on-site meeting at each of the proposed projects. Table 1.2 below is the list of individuals and groups invited. Attendees included staff from the BLM FFO, DJR, La Plata Archeological, and SWCA Environmental Consultants (SWCA).

Table 1.2. Individuals and Groups Invited to the On-site Meeting

Name	Group
Bruce Baizel, Pete Dronkers	Earthworks
Thomas Singer, Erik Schlenker-Goodrich, Kyle Tisdale	Western Environmental Law Center
Mike Eisenfeld	San Juan Citizens Alliance
Samantha Ruscavage-Barz, Jeremy Nichols, Rebecca Sobel	WildEarth Guardians
Anson Wright	Chaco Alliance
Lori Goodman	Diné Care
Don Schrieber	Devil Springs Ranch
Joe Trudeau	Center for Biological Diversity
Miya King-Flaherty	Sierra Club
Tweeti Blancett	Interested Public
Pinu'u Stout	Pueblo of San Felipe
Sonia Grant	University of Chicago/Private Citizen
Daniel Tso	Interested Public
All Pueblo Council of Governors	All Pueblo Council of Governors
Michael Casaus	New Mexico Wilderness Society

1.6.3 Issues Identified for Analysis

Using internal and external scoping in accordance with guidelines set forth in the BLM NEPA Handbook (BLM 2008a), the BLM FFO developed a list of issues to analyze in detail in this EA. The key issues identified during agency scoping are summarized in Table 1.3. The impact indicators provided are used to describe the affected environment for each issue in Chapter 3, to measure change in the issue for different alternatives, and to assess impacts of alternatives.

Table 1.3. Issues Identified for Detailed Analysis

Issue Number	Issue Statement	Impact Indicator
Issue 1	How would emissions generated by equipment associated with the Proposed Action impact air quality?	Emissions
Issue 2	How would the future potential development of the Proposed Action contribute to greenhouse gas (GHG) emissions?	Emissions
Issue 3	How would future drilling and completion operations associated with the Proposed Action impact groundwater quality and quantity?	Water Volumes Number of Wells
Issue 4	How would vehicle traffic and public road safety be impacted along the proposed haul truck route, which includes the community of Nageezi?	Increased Traffic

Issue Number	Issue Statement	Impact Indicator
Issue 5	How would noise generated during construction activities, including well drilling/completion, pipeline installation and access road construction, from heavy equipment affect nearby residences?	Noise from Construction Activities
Issue 6	How would construction and operation of the facilities associated with the Proposed Action, primarily the B02 and M35 project areas, impact the scenic quality for the Nageezi community?	Visual Impacts from Equipment
Issue 7	How would the development of the Proposed Action impact the quality of life of nearby residents, including the community of Nageezi?	Noise, Visual, Air Quality, Traffic, Water Quality
Issue 8	How would the development of the Proposed Action impact environmental justice communities, primarily the community of Nageezi?	Quality of Life, Traffic, Noise, Visual, Water Quantity and Quality, and Air Quality, including GHGs
Issue 9	How would the Proposed Action, particularly the proposed NU M35 and NU H33 project areas, impact suitable habitat for Clover's cactus?	Impacts to Suitable Habitat for Special Status Plant Species

1.6.4 Issues Identified but Eliminated from Further Analysis

As described in Section 1.6.3, agency scoping was utilized to determine the issues that require detailed analysis in this EA. Table 1.4 below includes a detailed explanation of remaining issues that were discussed but that will not be further analyzed in this EA. A "checklist" summarizing the BLM FFO's NEPA IDT discussions is included in Appendix G.

Table 1.4. Issues Identified but Eliminated from Detailed Analysis

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would proposed ground-disturbing construction, operation, and maintenance activities impact cultural resources?	Impacts to cultural resources from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. There are no Chaco Culture Archaeological Protection Sites or United Nations Educational, Scientific and Cultural Organization World Heritage Sites within or near the proposed project areas. Five Class III Archaeological Surveys (NMCRIS No. 144910; BLM Report No. 2020(II)010F, NMCRIS No. 144909; BLM Report No. 2020(II)011F, NMCRIS No. 144851; BLM Report No. 2020(II)0013F, NMCRIS No. 144852; BLM Report No. 2020(II)012F) were conducted in the proposed project areas. During two of these surveys, no cultural resources were discovered. During the survey for the NU G35 project (2020(II)0013F), two sites were identified. Both of these sites were given a Not Determined eligibility status for listing in the National Register of Historic Places (NRHP), and both sites would have temporary site protection fencing and the presence of an archaeological monitor. During the survey for the NU H33 project (2020(II)012F), two sites were identified, both of which were also given a Not Determined eligibility status for the NRHP. Both of these sites would also have temporary site protection fencing and the presence of an archaeological monitor. A fifth Class III Archaeological Survey was previously conducted for the NU M35 project (NMCRIS No. 141538; BLM Report No. 2019(I)007F). During this inventory, two sites were discovered, one of which were determined to be Eligible for listing in the NRHP, and the other site was given a Not Determined eligibility status. Both sites would have temporary site protection fencing and the presence of an archaeological monitor. These stipulations can be found in the In-House Survey Determination Form NM-210-2020-028. One more survey associated with this project was completed on tribal land (HPD-20-062). During this survey, one cultural site was discovered (NM-G-47-56). This site was determined to be Not Eligible for listing on the NRHP; therefore, no specific site protection stipulations will be required for this portion of the project. With adherence to the stipulations provided above, the proposed project will have No Effect to historic properties. Details of the cultural resources surveys of the proposed project areas, as well as results of Section 106 consultation and government-to-government consultation, are detailed in Chapter 4. Project design features and best management practices (BMPs) (detailed in Appendix H of the EA) would mitigate impacts to cultural resources to the point that detailed analysis is not warranted. The proposed projects would be in compliance with Section 106 of the National Historic Preservation Act (NHPA).
How would proposed ground-disturbing construction, operation, and maintenance activities impact Native American religious concerns or other concerns?	Impacts to traditional cultural properties (TCPs) from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. Results of the cultural resources surveys (which would include surveys for Native American religious concerns) of the proposed project areas, as well as results of NHPA Section 106 consultation and government-to-government consultation, are provided in Chapter 4. There are no known TCPs or sensitive cultural areas present in the proposed project areas. Project design features and BMPs (detailed in Appendix H of the EA) would mitigate impacts to cultural resources to the point that detailed analysis is not warranted. The proposed projects would be in compliance with the American Indian Religious Freedom Act of 1978 and Section 106 of the NHPA.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would proposed ground-disturbing construction, operation, and maintenance activities impact paleontological resources?	Impacts to paleontological resources from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. SWCA consulted with the BLM FFO regarding the potential for paleontological resource to occur within the proposed project area. The proposed project is not located within any specially designated area for paleontology but is located in an area of known paleontological resources within the Nacimiento Formation (Potential Fossil Yield Classification [PFYC] 5). The BLM conducted spot pedestrian surveys at two locations where potential for paleontological resource occurrence is high: where the pipeline comes off the bluff along CR 7800 and along the south and southeast side of the proposed M35-2409 well pad. Paleontological monitoring will be required during construction at these sites. If any paleontological resources are discovered during activities associated with the proposed project, DJR will inform the BLM Authorized Officer and activities in the vicinity of the discovery would be suspended or adjusted to avoid further impacts. The discovery would be protected from damage or looting. The BLM determined that the project design features and BMPs (detailed in Appendix H of the EA) would mitigate impacts to paleontological resources to the point that detailed analysis is not warranted (BLM 2020c). The proposed project would be in compliance with the Paleontological Resources Preservation Act of 2009.
How would proposed project activities impact the socio-economics of the Nageezi community?	The proposed cluster EA would provide positive socio-economic benefit through the pooling of oil and gas resources. This pooling and unitization of resources would provide marginal positive benefit overall but would not represent a major change to the socio-economic settings that are already in place in the Nageezi Chapter region. Pooling and unitization are general legal structures which allow for the combination of mineral and/or oil and gas leasehold interests in order to accommodate agency regulatory requirements. Each of these “structures” provide for a defined method of sharing production among the interest owners in a combined area or unit and the maintenance of the leases included in the applicable unit by allowing operations on, or production from, anywhere on the unitized area. The proposed action would allow for greater pooling for the Nageezi community. New Mexico has enacted broad legislation regarding the establishment of spacing or proration units from which oil and gas may be produced with emphasis on protecting correlative rights without waste of oil or gas in the pool and the reservoir energy. To this end, the Oil Conservation Division (OCD) has established statewide spacing and establishes field pool rules for specific spacing where the facts indicate the state spacing pattern should be altered to carry out the goal of protecting correlative rights and preventing waste. Recent update of OCD rules and regulations included an independent section for location of wells and spacing unit specific to horizontal wells. In that context, the NMOCD notices hearings when proposed horizontal spacing orders are being considered and solicits the input of the BLM. BLM will likewise involve the BIA/FIMO for concurrence on their recommendations to the NMOCD. Even inside a unit, the operator is required to meet subsurface setbacks form the unit boundary and comply with specific configurations of the horizontal spacing unit.
How would proposed project activities impact range improvements and livestock mobility associated with the existing allotment within the proposed project area?	Impacts to rangeland resources, including grazing allotments, from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project areas are located within the 47,698-acre Largo Community Allotment (No. 5083) and the 103,305-acre Kimbeto Community Allotment (No. 6013). The Proposed Action would disturb 49.6 acres, which is 0.03% of the total allotments’ acreage. The Proposed Action would not directly impact any existing range improvements or long-term trend plots. Project design features (detailed in Appendix H of the EA) would mitigate impacts to range improvements and livestock to the point that detailed analysis is not warranted.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would vegetation removal during proposed construction activities impact suitable foraging and nesting habitat for migratory birds?	Impacts to wildlife (including migratory birds) from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The BLM FFO manages approximately 435,500 acres within the Great Basin desert scrub plant community (BLM 2003b). The Proposed Action would result in the clearing of 49.6 acres of poor to marginal migratory bird nesting and foraging habitat within sagebrush shrubland (which is part of the Great Basin desert scrub plant community). The total amount of impacts associated with the proposed ground-clearing activities would be less than 0.01% of this community within the BLM FFO. Migratory bird nest surveys will be performed prior to any construction activities (May 15–July 31). Project design features (detailed in Appendix H of the EA) would mitigate impacts to a degree that detailed analysis is not warranted. The Proposed Action would be in compliance with the MBTA.
How would vegetation removal and increased noise during proposed construction activities impact federally listed threatened, endangered, and candidate species?	Impacts to federally listed species from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. SWCA performed biological surveys of the proposed project areas in July 2018 (NU M35), July 2019 (NU B02), and December 2019 (NU G35 and NU H33). The proposed project areas do not provide optimal habitat for any federally listed species (BLM 2018a, 2018b). See also the approved biological resource compliance form from the Navajo Nation Department of Fish and Wildlife in Appendix L. Additionally, the Proposed Action would not use any surface water that could affect federally listed threatened, endangered, and candidate species; all fresh water used for pad and road construction and well drilling and completion would be trucked from the Blanco Trading Post Water Well, point of diversion authorization number SJ-2105. There would be no new water depletions associated with Proposed Action. Further detailed analysis is not warranted. The Proposed Action would be in compliance with the ESA and with the PRMP/FEIS and associated biological assessment (BLM 2002). No further consultation with the U.S. Fish and Wildlife Service is required.
How would lighting associated with proposed construction activities impact stargazing potential within the surrounding area?	The proposed project areas are approximately 16.5 miles from Chaco Culture National Historical Park and thus would not impact stargazing from that area. Lighting associated with the proposed projects would only occur between the hours of 6:00 a.m. and 6:30 p.m. Project design features (detailed in Appendix H of the EA) would mitigate impacts to stargazing to a degree that detailed analysis is not warranted.
What is the potential for the spread of noxious weeds and invasive plants as a result of the proposed project?	The spread of weeds associated with BLM FFO–wide oil and gas development was analyzed in the PRMP/FEIS (BLM 2003b), as amended. Project design features (detailed in Appendix H of the EA) would mitigate the spread of weeds to the degree that detailed analysis is not warranted. The Proposed Action would be in compliance with the Federal Noxious Weed Act and New Mexico EO 00-22.
What vegetation impacts would occur as a result of proposed ground-disturbing activities?	Impacts to upland vegetation from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The BLM FFO manages approximately 435,500 acres within the Great Basin desert scrub plant community (BLM 2003b). The Proposed Action, which would result in the clearing of 49.6 acres of reclaimed sagebrush shrubland (which is part of the Great Basin desert scrub plant community), would impact less than 0.01% of this community within the BLM FFO. Project design features (detailed in Appendix H of the EA) would mitigate impacts to vegetation to the degree that detailed analysis is not warranted.
How would storage and transportation of hydrocarbon liquids impact drinking water sources or surface waters?	The proposed wells would be drilled using a closed-loop system to contain drill cuttings and fluids. The total depth of the proposed well bores would be about 5,990 to 10,515 feet below the ground surface. The producing zone targeted by the Proposed Action is well below any underground sources of drinking water. All chemicals stored on-site would be properly contained. On-site containment structures such as containment dikes, containment walls, and drip pans would be impervious and would be maintained to prevent a discharge to waters of the U.S. BMPs would ensure that no materials are discharged into downstream jurisdictional water features. Project design features (detailed in Appendix H of the EA) would mitigate impacts to drinking water and surface waters to the degree that detailed analysis is not warranted.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
What is the potential for impacts to oil and gas/energy production?	Impacts to oil and gas resources from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The commitment of these resources is also analyzed at the lease level. The Proposed Action would contribute to future mineral development within the NU. Further detailed analysis is not warranted.
What are potential impacts from waste (hazardous materials) associated with ground-disturbing activities?	Project design features (detailed in Appendix H of the EA), as well as the adherence to Onshore Oil and Gas Operations regulations (43 CFR 3160), would mitigate impacts associated with waste to the degree that detailed analysis is not warranted.
How would the construction and operation phases of the proposed project impact recreation and access to BLM land (for uses such as hunting, fishing, shooting, etc.)?	Impacts to recreation from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project areas are not located within a specially designated recreation area. Dispersed recreation opportunities similar in type are readily available across a wide area in and around the Proposed Action. The proposed projects would not restrict recreation opportunities, since recreation is dispersed throughout the area; therefore, detailed analysis is not warranted.
How would activities and facilities associated with the proposed project impact public access to BLM land?	Impacts to land and access from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. While public access roads and rights-of-way (ROWs) are present in the immediate area and would be used by personnel during all phases of the proposed projects, access to the public would not be restricted (other than the usage of potential, temporary flaggers, or other safety features). The presence of the proposed well pads would likewise not impact public use in the areas. Additionally, the use of mitigation measures will minimize the impacts and protect the existing ROWs. With standard design features and stipulations, no further analysis is needed.

2 Alternatives

2.1 Alternative 1 – Proposed Action Alternative

The Proposed Action is the BLM's approval of DJR's APDs as submitted, with COAs, design features and applicable mitigation measures that are developed as a result of this analysis. As a result of BLM approval, the proposed development project(s) would take place. DJR would construct the NU M35, NU G35, NU B02, and NU H33 well pads; horizontally drill, use, and plug between two and five oil wells per pad; and construct, use, and finally abandon the associated pipelines. Oil would be transported from the proposed pads along the proposed pipeline corridor to connect to DJR's existing pipeline infrastructure. When the oil wells are plugged and abandoned and no longer needed, the respective facility pads and associated access roads would be reclaimed.

The surface features associated with each individual project would consist of between two and five wellheads located on a well pad (including construction zone), an access road, and a pipeline. Additionally, NU M35 would have one G-tank (temporary above ground water tank used for well completion) and pad and one staging area; NU G35 would have two temporary use areas (TUAs); and NU B02 would have one G-tank pad and associated access road, one staging area, and six TUAs. Details of each project can be found in the APDs and Surface Use Plans of Operations (SUPOs) on file with the BLM FFO, including additional construction and maintenance activity details.

The Proposed Action would result in a total of 49.6 acres of new surface disturbance, of which 38.3 acres would be on BLM FFO surface and 11.3 would be on Navajo Allotted surface. Of these, 37.6 acres would be fully reclaimed (reseeded and recontoured) during interim reclamation (28.9 acres on BLM FFO surface and 8.7 acres on Navajo Allotted surface). The remaining 12.0 acres (9.4 acres on BLM FFO surface and 2.6 acres on Navajo Allotted surface) would remain disturbed throughout the life of the

projects and would be reclaimed when the wells are abandoned. Surface disturbance associated with the Proposed Action is summarized in Table 2.1 below.

Table 2.1. Proposed Action Surface Disturbance

Project Feature	Surface Disturbance (acres)		Interim Reclamation (acres)		Final Reclamation (acres)	
	BLM FFO	Navajo Allotted	BLM FFO	Navajo Allotted	BLM FFO	Navajo Allotted
NU M35						
Access road	1.9	-	-	-	1.9	-
Well pad and construction zone	6.8	-	4.6	-	2.2	-
Pipeline	1.0	-	1.0	-	-	-
G-tank pad	2.8	-	2.8	-	-	-
Staging area	0.6	-	0.6	-	-	-
Total	***13.1***	***0***	***9.0***	***0***	***4.1***	***0***
	13.1		***9.0***		***4.1***	
NU G35						
Access road	0.2	0.4	-	-	0.2	0.4
Well pad and construction zone	0.2	7.6	0.2	5.4	-	2.2
Pipeline	1.1	0.3	1.1	0.3	-	-
2 TUAs	0.3	-	0.3	-	-	-
Total	***1.8***	***8.3***	***1.6***	***5.7***	***0.2***	***2.6***
	10.1		***7.3***		***2.8***	
NU B02						
Well pad access road	<0.1	-	-	-	<0.1	-
Well pad and construction zone	7.1	-	4.9	-	2.2	-
Pipeline	2.9	2.3	2.9	2.3	-	-
G-tank pad and access road	1.9	-	1.9	-	-	-
Staging area	2.4	-	2.4	-	-	-
6 TUAs	1.3	0.7	1.3	0.7	-	-
Total	***15.7***	***3.0***	***13.4***	***3.0***	***2.3***	***0***
	18.7		***16.4***		***2.3***	
NU H33						
Access road	0.6	-	-	-	0.6	-
Well pad and construction zone	6.6	-	4.4	-	2.2	-
Pipeline	0.5	-	0.5	-	-	-
Total	***7.7***	***0***	***4.9***	***0***	***2.8***	***0***
	7.7		***4.9***		***2.8***	
Proposed Action Total	***38.3***	***11.3***	***28.9***	***8.7***	***9.4***	***2.6***

Project Feature	Surface Disturbance (acres)		Interim Reclamation (acres)		Final Reclamation (acres)	
	BLM FFO	Navajo Allotted	BLM FFO	Navajo Allotted	BLM FFO	Navajo Allotted
	49.6		***37.6***		***12.0***	

2.1.1 Access Roads

The four access roads would be constructed in accordance with the BLM Gold Book Standards and BLM 9113-1 (Roads Design Handbook) and BLM 9113-2 (Roads National Inventory and Condition Assessment Guidance and Instructions Handbook). Each access road would be constructed with a 14-foot-wide running surface with the bottoms of the 8-foot-wide bar ditches along each side of the access road that would remain disturbed throughout the life of the project; this acreage would be reclaimed during final reclamation.

Additionally, there would be a total of three 150-foot-long, 20-foot-wide (0.1-acre) pullouts along portions of the NU M35 access road. See Table 2.1 for each proposed project's components and associated surface disturbance.

2.1.2 Well Pads and Construction Zones

The well pads, which vary in size and shape, would include a 50-foot-wide construction zone surrounding the well pad's perimeter. The working area for each pad (approximately 2.2 acres) would remain disturbed throughout the life of the projects; this acreage would be reclaimed during final reclamation. The remaining disturbed areas of the well pads and construction zones would be reseeded and recontoured during interim reclamation. See Table 2.1 for each proposed project's components and associated surface disturbance.

2.1.3 Pipelines

There would be a total of approximately 17,085 feet of pipeline corridors constructed parallel and adjacent to the proposed access roads and existing San Juan County Road 7800. Portions of the pipeline corridors would also overlap sections of well pad construction zones, G-tank pads, and TUAs. The overlapping acreages were subtracted out of the total acreage of impacts; therefore, the acreages included in Table 2.1 above only reflect the actual disturbance and no overlap. All pipeline disturbance would be reseeded and recontoured during interim reclamation.

2.1.4 Temporary Use Areas

There would be a total of eight TUAs, two associated with the NU G35 and six associated with the NU B02 pipeline corridors, where the pipeline(s) would cross ephemeral drainages, existing pipelines, and roads. The TUAs would be reclaimed during interim reclamation. See Table 2.1 for each proposed project's components and associated surface disturbance.

2.1.5 G-Tank Pads

The two G-tank pads would each measure 250 × 250 feet. One G-tank pad would have a 50-foot-wide construction zone; the other would have a 30-foot-wide construction zone that would surround its perimeter. The G-tanks, which are approximately 12 feet tall and measure 150 feet in diameter, would contain 44,000 barrels of water for use during well completion. A lay-flat water completion line would be located along each of the G-tank access roads and utilized between the G-tank pads and well pads during

completion. The tank and water completion line would be removed, and the entire disturbed area would be fully reclaimed after the wells have been completed. See Table 2.1 for each proposed project's components and associated surface disturbance.

2.1.6 Staging Areas

There would be two staging areas associated with the Proposed Action. The staging areas would be used for pipeline boring, construction equipment, and soil stockpiling. All of the disturbance associated with the staging areas would be reclaimed during interim reclamation. See Table 2.1 for each proposed project's components and associated surface disturbance.

2.1.7 Construction, Drilling, and Completion

Prior to construction, the proposed project areas would be staked to ensure that all activity would be confined to authorized areas. Staking would be maintained for the duration of construction activities.

The construction phase is anticipated to begin in February 2021, after the BLM's approval of the APDs. Each proposed project would take approximately 3 to 4 months to complete, which includes access road and well pad construction, pipeline construction, and well drilling and completion. Within the 3 to 4 months of construction activities, it would take 4 to 6 weeks to construct the access road and well pad, 3 to 4 weeks for pipeline construction, and 1 to 2 weeks per wellhead (which could total 8 to 10 weeks for five wells on one well pad). Construction may take place concurrently; however, if construction occurs sequentially, the total cumulative amount of time it would take to complete construction of the Proposed Action (the NU M35, NU G35, NU B02, and NU H33 well pads) would be approximately 12 to 16 months.

Equipment mobilization and demobilization would consist of six to eight transport truckloads to deliver and remove heavy equipment to and from each proposed project area; this equipment would remain on-site until construction is complete. During construction of the access roads, well pads, and pipelines, it is estimated that 20 to 30 construction personnel would be on-site 6 days per week (Monday–Saturday) between the hours of 6:00 a.m. and 6:30 p.m.; they would be transported to and from the site by 10 to 15 standard-size pickup trucks. Construction personnel would be on-site 24 hours per day/7 days per week during the well drilling and completion phase for each proposed project.

Construction equipment may include chainsaws, a brush hog, scraper, maintainer, excavator, dozer, backhoe, hydrovac, welder, trencher, side-boom, and miscellaneous specialty equipment. Standard drilling operation equipment includes drilling rig with associated equipment, temporary office trailers equipped with sleeping quarters for essential company personnel, toilet facilities, and trash containers.

Following construction activities, interim reclamation would occur within portions of the proposed project areas not required for long-term operation. DJR would adhere to any conditions required by the BLM FFO. A list of design features, also captured in the SUPOs, and best management practices (BMPs) that DJR has committed to, is provided in Appendix H.

2.1.8 Operation

The projected in-service date is September 2021. The anticipated lifespan of the Proposed Action is 20 years.

The production equipment for each project area will include up to nine compressor engines, 13 indirect heaters, three vapor recovery towers, eight 400-barrel (bbl) comingled liquid storage tanks, two 400-bbl produced water storage tanks, four enclosed combustion devices, and pneumatics.

2.1.9 Final Reclamation

When the proposed wells are no longer needed, they would be terminated/plugged as required by the BLM. Final reclamation would take place within all disturbed portions of the Proposed Action and is detailed in each proposed project's SUPO on file with the BLM.

2.2 Alternative 2 – No Action Alternative

Under this alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. The No Action Alternative is presented as the baseline for impacts analysis in Chapter 3 (Affected Environment and Environmental Consequences).

3 Affected Environment and Environmental Consequences

3.1 Issue 1: How would emissions generated by equipment associated with the Proposed Action impact air quality?

3.1.1 Affected Environment

Air quality is determined by the quantity and chemistry of atmospheric pollutants in consideration of meteorological factors (i.e., weather patterns) and topography, both of which influence the dispersion and concentration of those pollutants. The analysis area for impacts on air quality consists of San Juan, Sandoval, Rio Arriba, and McKinley Counties. This spatial scope of analysis was identified based on the regional nature of air pollution and to facilitate analysis using the best available air quality data, which are generally provided at the county level. Much of the information referenced in this section is incorporated by reference from the *Air Resources Technical Report for Oil and Gas Development: New Mexico, Oklahoma, Texas and Kansas* (herein referred to as the Air Resources Technical Report) (BLM 2020b).

3.1.1.1 NATIONAL AMBIENT AIR QUALITY STANDARDS

The Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Primary standards provide public health protection, and secondary standards provide for public welfare, including protection against degraded visibility and damage to animals, crops, vegetation, and buildings (EPA 2020a). The primary NAAQS are set at a level to protect public health, including the health of at-risk populations, with an adequate margin of safety (EPA 2020a). The EPA has set NAAQS for seven principal pollutants ("criteria" air pollutants): carbon monoxide (CO); nitrogen dioxide (NO_2); ozone (O_3); particulate matter equal to or less than 10 microns in diameter (PM_{10}); particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$); sulfur dioxide (SO_2); and lead (Pb) (EPA 2015). The EPA has delegated the responsibility of regulation and enforcement of the NAAQS to the state level and has approved the New Mexico State Implementation Plan (SIP), which allows the State to enforce both the New Mexico Ambient Air Quality Standards (NMAAQS) and the NAAQS on all public and private land with the exception of tribal land and land within Bernalillo County. The New Mexico Environment Department (NMED) Air Quality Bureau is responsible for implementation of the SIP and enforcement of air quality standards (NMED 2020a).

Areas that are in attainment of the NAAQS are categorized as either Class I, Class II, or Class III, which determines the increment of air quality deterioration allowed. All areas that attain the NAAQS and are not specifically designated as Class I areas under the CAA are considered to be Class II for air quality, where a moderate amount of degradation is permitted. The analysis area is in attainment for the NAAQS and the NMAAQS and is categorized as a Class II area (EPA 2020b; NMED 2018).

Design Values are statistics that describe the air quality in a certain area relative to the NAAQS; they are to be consistent with NAAQS as defined in 40 CFR 50. Design Values are generally used to classify and designate non-attainment areas (EPA 2015). The measurement parameters for each air monitor vary depending on the criteria pollutant being monitored, the scale at which that pollutant is being measured, the duration and frequency of the monitoring sample, and the monitor objective. CAA regulations establish design criteria for ambient air quality monitoring networks (also known as state and local air monitoring stations), including "scales of representativeness of most interest" for monitoring sites, ranging from national and global scales down to the local level (EPA 2012). Table 3.1 summarizes the Design Value concentrations of criteria pollutants within the analysis area, compared with the NAAQS and NMAAQS. The counties in the analysis area do not currently monitor for CO, Pb, or $PM_{2.5}$; however, because the counties are relatively rural in character, it is likely that these pollutants are not elevated.

Table 3.1. Design Values for Counties within the Analysis Area

Pollutant	2019 Design Concentrations	Averaging Time	NAAQS	NMAAQS [a,b]
O_3	Rio Arriba County: 0.067 ppm Sandoval County: 0.068 ppm San Juan County: 0.070 ppm: three stations; Bloomfield at 0.069 ppm, Navajo Dam at 0.070 ppm, Shiprock at 0.069 ppm	8-hour	0.070 ppm [a]	–
NO_2	San Juan County: three stations; Bloomfield at 10 ppb, Navajo Dam at 6 ppb, Shiprock at 3 ppb	Annual	53 ppb [b]	50 ppb
NO_2	San Juan County: Bloomfield at 34 ppb	1-hour	100 ppb [c]	–
SO_2	San Juan County: 2 ppb	1-hour	75 ppb [c]	–
PM_{10}	San Juan County: Invalid monitor data [e]	24-hour	150 µg/m^3 [d]	–

Source: EPA (2020a)

ppm = parts per million, ppb = parts per billion, µg/m^3 = micrograms per cubic meter

[a] Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years.

[b] Annual mean.

[c] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

[d] Not to be exceeded more than once per year on average over 3 years.

[e] PM_{10} monitor stations currently show installed locations in the planning area (San Juan County); however, the monitor status of these stations show invalid data and cannot be used to represent design values.

[f] The NMAAQS standard for total suspended particulates, which was used as a comparison with PM_{10} and $PM_{2.5}$, was repealed as of November 30, 2018.

[g] While there are no NAAQS for hydrogen sulfide (H_2S), New Mexico has set a 1-hour standard for H_2S at 0.010 ppm for all areas of the state outside of the area within 5 miles of the Pecos-Permian Air Quality Control Region (BLM 2020b).

Ozone, Nitrogen Oxides, and Volatile Organic Compounds

Ozone (O_3) is a criteria pollutant that is of most concern for the analysis area. Breathing O_3 can have human health impacts, particularly for sensitive groups (children, the elderly, and those with chronic lung conditions like bronchitis, emphysema, and asthma), as well as sensitive vegetation (NMED 2020a). O_3 is most likely to reach unhealthy levels on hot, sunny days in urban environments and can be transported long distances by wind into rural areas (EPA 2020c). As a secondary pollutant, O_3 is not a direct emission pollutant (i.e., it is not emitted directly into the air), but it is the result of chemical reactions between a

group of highly reactive gases called nitrogen oxide(s) (NO_x) and volatile organic compounds (VOCs), which are organic compounds that vaporize (i.e., become a gas) at room temperature when exposed to sunlight (EPA 2020c). O_3 and NO_2 are criteria air pollutants and therefore are regulated under the NAAQS and NMAAQS; VOCs are not regulated; however, because O_3 is not a direct emission, emissions of NO_x (particularly NO_2, which is used as an indicator for the larger group of gases) and VOCs are used as a proxy for determining potential levels of secondary formation of O_3. NO_x can also react with other chemicals in the air to form particulate matter, contributing to haze (EPA 2020b). Major sources of emission for both NO_x and VOCs include industrial facilities like power plants and motor vehicle exhaust (including off-road equipment). NO_x is primarily emitted through fossil fuel combustion in electric utilities, high-temperature operations at other industrial sources, and the operation of motor vehicles (EPA 2020b). VOCs are emitted from burning fuels (gasoline, wood, coal, or natural gas) and are associated with refineries, oil and gas production equipment, and other industrial processes. VOCs are also released from chemicals like solvents, paints and thinners, adhesives, air fresheners, copy machines and printers, cleaners and disinfectants, and other consumer products (National Institute of Health, U.S. National Library of Medicine 2017). Biogenic sources, such as trees and plants, can also represent a substantial portion of NO_x and VOC emissions in an area, including New Mexico (BLM 2020b). The upstream sources of VOCs that are produced during the production of oil and gas are during the separation of gases from liquids and the storage process. Such emissions are generally controlled with the use of enclosed combustion devices, such as flares. Leaks and ineffective control systems are also a source of VOC emissions. In the event that VOCs are produced from incomplete combustion, they become more highly reactive O_3 precursors (Matichuk et al. 2016).

Monitoring conducted by the NMED (under the EPA) in the analysis area indicates that levels of O_3 have come close to, but have not yet exceeded, the NAAQS in San Juan County. If such exceedances were to occur, the area would be designated as being in "nonattainment," which could impact industrial development for the area (NMED 2020b). The NMED Air Quality Bureau has begun developing an Ozone Attainment Initiative, which, if implemented on schedule, will have a plan in place by fall 2020. The Ozone Attainment Initiative plan will set standards for emission sources that contribute to the exceedance of design values of 95% or more, in particular to control NO_x and VOCs to achieve maintenance or attainment of the standards pursuant to New Mexico Statutes 74-2-5.3 (NMED 2020c).

Particulate Matter

Particulate matter (also known as particle pollution) is a mixture of solid particles and liquid droplets in the air. Particulate matter varies in size. PM_{10} refers to particulate matter 10 micrometers or less in diameter (commonly considered "dust"). $PM_{2.5}$ refers to particulate matter that measures 2.5 micrometers or less (i.e., fine particles) and is the main cause of reduced visibility (haze) in the United States (EPA 2020d). The EPA regulates inhalable particulate matter 10 micrometers in diameter or smaller (PM_{10} and $PM_{2.5}$) because they are inhalable into the lungs (NMED 2020d) but does not regulate particles larger than 10 micrometers in diameter (such as sand and larger dust particles). $PM_{2.5}$ is not currently monitored in the analysis area, and there are no areas of high concentrations that would warrant monitoring by the NMED.[1] Recent monitoring for PM_{10} (dust) in the analysis area began in 2017 at the 1H Substation. Like O_3, most particulate matter is formed by reactions between other chemicals, specifically between SO_2 and NO_x, which are emitted from vehicles, power plants, and other industrial processes (EPA 2020d). Particulate matter emissions often result from activities like construction, traffic on unpaved roads, fields, and wildfires (EPA 2020d). Particulate matter is of heightened concern when emissions are near sensitive

[1] There is one recently inactive neighborhood monitor for $PM_{2.5}$ (fine particulate matter) in the analysis area located at the NMED office in Farmington (with a last sample date of December 29, 2015). It is assumed that operation of this monitor was discontinued after 2015 with approval from the EPA because the affecting sources had been shut down. Other air monitors for $PM_{2.5}$ in the analysis area that are currently inactive went out of operation more than 10 years ago. The inactive monitors measured $PM_{2.5}$ levels at the neighborhood scale; none of the inactive monitors measured regional $PM_{2.5}$ levels.

receptors, such as residences, because particulate matter can be present in higher concentrations in a localized area prior to settling or dispersion.

3.1.1.2 HUMAN-CAUSED EMISSIONS

Along with criteria pollutant concentrations as measured by air monitors, the EPA provides data on human-caused criteria pollutant emissions, expressed in tons per year or total volume of pollutant released into the atmosphere. Human-caused emissions data point to those industries and/or practices that are contributing the most to the general level of pollution (BLM 2020b). Total human-caused emissions within the analysis area are reported in Table 3.2, based on 2014 National Emissions Inventory (NEI) in tons per year (EPA 2014a).

These emissions are primarily the result of electrical power generation, oil and gas development, vehicles (highway and off-highway traffic), and other industrial activities (EPA 2014a). The primary sources of several criteria air pollutants in the analysis area are two coal-fired electrical generation units: the San Juan Generating Station (15 miles west of Farmington, New Mexico) and the Four Corners Power Plant (on the Navajo Nation near Fruitland, New Mexico). These electrical generation units are the primary source of SO_2, NO_x, and $PM_{2.5}$ in the analysis area (BLM 2020b; EPA 2014a). Oil and gas development is also a prominent source of emissions. There are approximately 23,034 active oil and gas wells in the New Mexico portion of the San Juan Basin, which has been a producing oil and natural gas field since the early to middle 1900s. About 16,139 of the wells in the aforementioned counties are federal wells, with the remainder falling in other jurisdictions (BLM 2020b). Over the last 5 years, there have been 243 federal well completions, all of which occurred within the BLM FFO (BLM 2020b).

The Western States Air Resources Council–Western Regional Air Partnership (WESTAR-WRAP) conducted an oil and gas emissions inventory report for base year 2014 to further clarify the contributions of oil and gas activities to human-caused emissions within the Permian and San Juan Basins. The results indicate that there are non-point sources, including fugitive components, pneumatic devices, pumps, and well blowdown events, that may not be reported through the state and federal inventories. These nonpoint sources could represent greater criteria, hazardous air pollutants (HAPs), and greenhouse gas (GHG) emissions within these basins, in particular VOC and NO_x emissions that contribute to O_3 formation. It is therefore believed that the 2014 NEI data in Table 3.2 related to petroleum and related industries are underreported in terms of VOC and NO_x emissions. Table 3.2 provides a comparison of the NEI and WESTAR-WRAP data sets.

As shown in the table, a comparison of data sets indicates that oil and gas development–related NO_x and VOC emissions may be underreported by approximately 58% and 49%, respectively.

Table 3.2. Human-Caused Emissions in the New Mexico Portion of the San Juan Basin, in Tons per Year

Emissions	NO_X	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2
2014 NEI—all sources	70,254	166,934	93,762	118,725	18,898	6,603
2014 NEI—petroleum and related industries	25,011	–	66,385	–	–	–
WESTAR-WRAP 2014 oil and gas sources	44,433	–	86,173	–	–	–

Sources: EPA (2014a); Ramboll Environ (2017). Includes data for San Juan, Sandoval, Rio Arriba, and McKinley Counties.

Notes: Values include Tier 1 summaries for each county, including combustion, industrial, on-road/non-road, and miscellaneous sectors. Biogenic sources are not included.

Only precursor pollutants to O_3 formation are compared in this analysis (NO_x and VOCs).

The data above do not consider the following changes in operations at the San Juan Generating Station (a four-unit, coal-fired generator) and the Four Corners Power Plant (a five-unit, coal-fueled generator) to meet the requirements of the federal regional haze rule:

- In 2016, two of the four units at the San Juan Generating Station had selective catalytic reduction technology installed to satisfy Best Available Retrofit Technology (BART) requirements from the EPA (Enchant Energy 2019). The installation of selective catalytic reduction technology is estimated to result in a 67% reduction in SO_2, 62% reduction in NO_x, 50% reduction in particulate matter, 44% reduction in CO, 51% reduction in VOCs, 50% reduction in CO_2, and 50% reduction in mercury (BLM 2020b). In December 2017, the two units that did not meet the BART requirements were closed. In March 2018, an explosion at one of the two remaining units rendered it inoperable (*Navajo Times* 2018).
- In 2013, three of the five units at the Four Corners Power Plant were shut down. In mid-2018, the two remaining units had selective catalytic reduction technology installed to satisfy BART requirements from EPA (*Power Magazine* 2019). It is estimated that this retrofit will result in a 36% reduction in NO_x, 61% reduction in mercury, 43% reduction in particulate matter, 30% reduction in CO_2, and 24% reduction in SO_2 (BLM 2020b).

3.1.1.3 AIR QUALITY INDEX

The level of emission for a pollutant, in consideration of weather and geographical influences, is a key factor affecting the concentration of that pollutant in an area. Emissions, which contribute to concentrations, can be understood through the Air Quality Index (AQI). The AQI is used to report daily air quality information in an easy-to-understand way by explaining how local air quality relates to human health. Calculated by the EPA, the AQI considers the following: O_3, particulate matter ($PM_{2.5}$ and PM_{10}), NO_2, SO_2, and CO. According to the EPA, O_3 and particulate matter, both calculated daily for the AQI, are the two air pollutants that pose the greatest threat to human health (AirNow 2016). The higher the AQI value, the greater the level of air pollution and the greater the concern for public health. An AQI value of 100 typically corresponds to the NAAQS set for that pollutant, and values below 100 are considered satisfactory for public health. The AirData AQI interactive map and summary report (EPA 2019a) provides annual summary information, including maximum AQI values and the count of days in each AQI category. Table 3.3 provides a summary of the number of days classified above 100 (unhealthy for sensitive groups or worse) for the counties in the analysis area for the period from 2008 through 2018.

Table 3.3. AQI Summary Data for Number of Days Classified above 100 for the Analysis Area (2008–2018)

County	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
San Juan	3	0	20[b]	18	12	6[c]	0	2	2	6	16	0
Sandoval	0	0	0	0	0	0	0	0	0	1	12	0
Rio Arriba	0	0	0	0	0	2	0	0	0	3	3	0
McKinley	0	0	0	0	0	0	–	–	–	–	–	-

Source: EPA (2019b)

Note: All AQI values presented are classified as unhealthy for sensitive groups (101–150), unless otherwise indicated. Annual summary data for McKinley County are only available for 2008–2013.

[a] Including 1 unhealthy day (above 150).

[b] Including 5 unhealthy days (above 150) and 2 very unhealthy days (above 200).

[c] Including 1 unhealthy day (above 150).

For the reporting period, San Juan County had the most incidences of the number of days classified above 100 annually, including 8 days reaching unhealthy (7 days above 150) to very unhealthy (2 days above 200) for everyone. These days occurred in 2010 (5 unhealthy days and 2 very unhealthy days) and 2013 (1 unhealthy day). While there are exceedances of NAAQS on those days with AQI values over 100, these exceedances do not represent a trend of degrading AQI values over time (BLM 2020b).

3.1.1.4 HAZARDOUS AIR POLLUTANTS

The CAA requires control measures for HAPs, which are a class of 187 toxic air pollutants that are known or suspected to cause cancer or other serious health impacts and/or adverse environmental impacts. National Emissions Standards for Hazardous Air Pollutants (NESHAPs), established by the EPA, limit the release of specified HAPs from specific industries (BLM 2020b). NESHAPs for oil and gas development include control of benzene, toluene, ethyl benzene, mixed xylenes, and n-hexane from major sources, and benzene emissions from triethylene glycol dehydration units as area sources (BLM 2020b). The CAA defines a major source for HAPs as being one that emits 10 tons per year of any single HAP or 25 tons per year of any combination of HAPs. Under state regulations, a construction or operating permit may be required for a major source and, for New Mexico, determining a major source requires consideration of each oil and gas exploration and production well individually (BLM 2020b). In New Mexico, regulations for major sources are found under 20.2.70 and 20.2.71 New Mexico Administrative Code.

The Air Resources Technical Report discusses the relevance of HAPs to oil and gas development and the particular HAPs that are regulated in relation to these activities (BLM 2020b). The EPA conducts a periodic National Air Toxics Assessment (NATA) that quantifies HAP emissions by county in the United States. A review of the results of the 2014 NATA shows that cancer, neurological risks, and respiratory risks in the analysis area (San Juan, Sandoval, Rio Arriba, and McKinley Counties) are generally lower than statewide and national levels, as well as those for Bernalillo County, where urban sources are concentrated in the Albuquerque area (EPA 2014b).

3.1.2 Environmental Impacts – No Action Alternative

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. No resulting impact to air quality or increases in fugitive dust would occur.

3.1.3 Environmental Impacts – Proposed Action

Construction activities associated with the Proposed Action would result in emissions from the operation of internal combustion engines, as well as the emission of particulates (specifically PM_{10}) associated with fugitive dust from drilling and the operation of vehicles and equipment on unpaved roads. These emissions would be temporary (approximately 3–4 months for each well, which would not necessarily be developed concurrently, cumulative total of approximately 12–16 months), would rapidly disperse and would be minimized through application of air resource-protection design features (see Appendix H). As such, construction associated with the Proposed Action is unlikely to contribute to a violation of air quality regulations.

Operation activities associated with the development of the Proposed Action would result in annual increased criteria pollutant emissions, including increased particulate matter (fugitive dust) from operational road traffic; exhaust emissions from equipment, compressor engines, generators, and flares; and VOCs resulting from oil storage activities. The 16 oil wells would emit the majority of operational emissions associated with the proposed project; any other emissions (such as fugitive dust from the well

pads or fugitive emissions from the four pipeline corridors) would be minimized through design features. Please reference the SUPOs on file with the associated APDs for more details on minimalizing fugitive emissions. Table 3.4 shows estimated modeled annual emissions from operation of the 16 oil wells and the percent increase in criteria pollutants over existing conditions. Emissions calculations in Table 3.4 are based on preliminary engineering. While design refinements may affect some individual criteria pollutant emissions, the overall emissions reported below are a conservative estimate and it is expected that any changes as a result of final engineering would reduce overall emissions. See Appendix I for the preliminary draft emissions summary tables submitted to NMED; the complete NMED Air Quality Emission Application is on file with NMED.

Table 3.4. Annual Emissions from Operation of the Well Pad and Wells

	Emissions (tons per year)					
Emissions	**NO_x**	**SO_2**	**CO**	**VOC**	**PM_{10}**	**$PM_{2.5}$**
Current human-caused emissions (San Juan, Sandoval, Rio Arriba, and McKinley Counties)	70,255	6,603	166,934	93,762	118,725	18,898
Emissions from Nageezi Units 2309 and 2409 Cluster oil wells [a]	69.87	0.08	125.23	292.90	3.27	3.07
Increase	0.099%	0.001%	0.075%	0.312%	0.003%	0.016%

[a] DJR (2020). See Appendix I for more details.

The CAA defines a major source for HAPs as being one that emits 10 tons per year of any single HAP or 25 tons per year of any combination of HAPs. DJR estimates that HAP emissions would be 20.42 tons per year (DJR 2020a). Based on the emissions reported above, the Nageezi Units 2309 and 2409 Cluster oil wells would be considered a minor source unit and may be permitted under a General Construction Permit per 20.2.72 New Mexico Administrative Code (NMAC). See Appendix I for the preliminary draft emissions summary tables. Because the increase in overall emission levels would be low (0.001%–0.312%), development of the Proposed Action would not be expected to increase the number of days classified above 100 (unhealthy for sensitive groups, or worse). Therefore, it is not anticipated that the Proposed Action would result in a change in the AQI for the analysis area. This incremental increase would not be expected to result in exceeding the NAAQS or state air quality standards for any criteria pollutants in the analysis area.

3.1.4 Cumulative Impacts

3.1.4.1 CUMULATIVE IMPACT AREA

The cumulative impact area for this analysis is the New Mexico portion of the San Juan Basin.

3.1.4.2 PAST AND PRESENT ACTIONS

Current annual estimated emissions (see Tables 3.2 and 3.5) are reflective of the effects of past and present actions. Two major sources of criteria pollutant and VOC emissions are the San Juan Generating Station and the Four Corners Power Plant (BLM 2020b); however, the 2017 shutdown of two of the four units at the San Juan Generating Station and the 2016 and 2018 retrofitting of the remaining units both at the San Juan Generating Station and the Four Corners Power Plant are expected to decrease emissions substantially (see Section 3.1.1.2).

Oil and gas development is also a prominent source of emissions. There are approximately 23,034 active oil and gas wells in the New Mexico portion of the San Juan Basin; of these, 16,139 are federal wells. There have been 243 federal well completions in the FFO over the last 5 years (see Section 3.1.1.2). While there are exceedances of NAAQS on those days with AQI values over 100 (see Table 3.3), these exceedances do not represent a trend of degrading AQI values over time (BLM 2020b).

3.1.4.3 REASONABLY FORESEEABLE FUTURE ACTIONS

The Reasonably Foreseeable Development Scenario for Oil and Gas Activities: Mancos-Gallup Resource Management Plan Amendment (RMPA) Planning Area, Farmington Field Office, northwestern New Mexico (2018 RFD) (Crocker and Glover 2018) was used to determine the number of oil and gas wells in the Mancos-Gallup RMPA Planning Area; this planning area includes most of the FFO and is where most potential oil and gas development is assumed to occur. The BLM considers the 2018 RFD to contain the most accurate information about the reasonably foreseeable number of wells and surface disturbance for the New Mexico portion of the San Juan Basin. Continued oil and gas development is a prominent reasonably foreseeable future action impacting air quality in the analysis area. The 2018 RFD estimates that there could be an additional 3,200 wells drilled within the analysis area by 2037 (Crocker and Glover 2018), or about 160 wells per year. Annual emissions associated with the RFD are disclosed in Table 3.5.

PNM announced its intent to close the San Juan Generating Station in 2022, when the coal supply agreement expires. However, the City of Farmington has indicated interest in retaining ownership post-2022 and has teamed with Enchant Energy to repurpose the San Juan Generating Station into a commercial-scale carbon-capture utilization and sequestration facility and wholesale power generator (Enchant Energy 2019). A July 2019 pre-feasibility study recommended development of a more in-depth front-end engineering and design study (Sargent and Lundy 2019). The Los Alamos National Laboratory completed an independent assessment of post-combustion capture of carbon dioxide (CO_2) in December 2019. The assessment determined that using an amine-based capture system is a technically viable option that is commercially available and has been demonstrated to provide greater than or equal to 90% CO_2 capture out of a continuous flue gas stream (Los Alamos National Laboratory 2019). Given the uncertainties around this project, expected reductions in emissions are not included in the cumulative impact emissions disclosed below.

The NMED Air Quality Bureau has begun developing an Ozone Attainment Initiative to set standards for emission sources that contribute to the exceedance of design values of 95% or more, in particular to control NO_x and VOCs to achieve maintenance or attainment of the standards pursuant to New Mexico Statutes 74-2-5.3 (NMED 2020a).

3.1.4.4 CUMULATIVE IMPACT ANALYSIS

Table 3.5 quantifies annual emissions from past, present, and reasonably foreseeable future actions in conjunction with the operation of the Proposed Action.

The development of the proposed Nageezi Units 2309 and 2409 Cluster oil wells would result in an incremental increase in overall emission levels between 0.268% and 2.931% of existing emissions. With the exception of VOCs, the Proposed Action would generally comprise a small percentage of cumulative emissions. Emissions associated with the 2018 RFD are anticipated to be at the most acute level during well construction and completion phases; because not all wells would be constructed at the same time, it is anticipated that the incremental addition of criteria pollutants and VOCs may be lower than reported above. Accordingly, the cumulative impacts disclosed above are not be expected to result in any exceedances of the NAAQS or NMAAQS for any criteria pollutants in the analysis area. Because the increase in overall emission levels would be low (2.931% or less), development of the Proposed Action in

conjunction with other reasonably foreseeable future actions would not be expected to increase the number of days classified above 100 (unhealthy for sensitive groups, or worse).

Table 3.5. Cumulative Air Emissions from Oil and Gas Development

	Emissions (tons per year)					
	NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$
Current human-caused emissions (New Mexico portion of San Juan Basin)	70,255	6,603	166,934	93,762	118,725	18,898
Total annual emissions from the RFD (160 wells/year) [a]	961.60	17.60	408.00	2,456	849.60	131.20
Construction and operations of the Nageezi Units 2309 and 2409 Cluster oil wells [b]	69.87	0.08	125.23	292.90	3.27	3.07
Total	1,031.47	17.68	533.23	2,748.60	852.87	134.27
Increase	1.468%	0.268%	0.319%	2.931%	0.718%	0.710%
Contribution of Proposed Action to total annual cumulative impact	6.773%	0.452%	23.485%	10.645%	0.383%	2.286%

[a] The representative well used to calculate emissions is a horizontal oil well. Emissions for vertical wells were not used from this analysis due to current predominance in horizontal technological drilling methods and because presenting horizontal oil wells emissions estimates represents a more conservative summary of emissions, compared with emissions from a vertical well, with the exception of SO_2, which could be four to five times greater in a vertical well scenario. However, SO_2 emissions are still estimated to be within the same magnitude and less than 1 ton per year of SO_2 emissions per well. Because oil wells are the predominant type of well in the FFO area, this analysis assumes that all the developed wells will be oil wells. Gas well emission factors are shown as well for comparison. See Appendix G for additional discussion of emission factors.

[b] DJR (2020a). See Appendix I for more details.

Additionally, emissions associated with the 2018 RFD scenario and development of the Proposed Action would be offset by substantial decreases in emissions in the power generation sector resulting from shutdown of two of the units at the San Juan Generating Station, and the installation of selective catalytic reduction technology at both the San Juan Generating Station and the Four Corners Power Plant; these changes are not yet accounted for in current human-caused emissions estimates. Emissions may also be reduced through the Ozone Attainment Initiative. Cumulatively, it is expected that future levels of criteria pollutant, VOC, and HAP emissions would be lower than current levels due to the aforementioned factors, despite the increases in emissions associated with reasonably foreseeable oil and gas development and the Proposed Action.

3.1.5 Mitigation and Residual Impacts

Design features (detailed in Appendix H) have been established to minimize dust by limiting surface disturbance, requiring interim reclamation, and requiring dust control on dirt roads. These design features include limiting NO_x emissions from compressors with engines of 300 horsepower or less, revegetating areas not needed for proposed project facilities, and spraying dirt roads. As such, no additional mitigation is proposed, and residual impacts would be the same as described in Section 3.1.3 (Environmental Impacts – Proposed Action). As described in that section, residual construction impacts would be temporary and would rapidly disperse. Residual operations impacts would be generally limited to those associated with emissions from the 16 wells, which would be considered a minor source unit permitted under a General Construction Permit per 20.2.72 NMAC.

3.2 Issue 2: How would the future potential development of the Proposed Action contribute to greenhouse gas (GHG) emissions?

The analysis areas associated with this issue are the state of New Mexico and the United States. These geographic scales are used in this analysis to provide multiple levels of context associated with GHG emissions as a result of the future potential oil and gas development of the Proposed Action. In addition, the effects of GHG emissions are global in nature.

3.2.1 Affected Environment

Climate change is a statistically significant and long-term change in climate patterns. The terms climate change and "global warming," though often used interchangeably, are not the same. Climate change is any deviation from the average climate via warming or cooling and can result from both natural and human (anthropogenic) sources. Natural contributors to climate change include fluctuations in solar radiation, volcanic eruptions, and plate tectonics. Global warming refers to the apparent warming of climate observed since the early twentieth century and is primarily attributed to human activities such as fossil fuel combustion, industrial processes, and land use changes.

The following information about GHGs, their relationship to climate change, and their effects on national and global climate is presented in the Air Resources Technical Report (BLM 2020b) and briefly summarized here: Findings indicate that warming of the climate system is unequivocal and many of the observed changes are unprecedented over decades to millennia. It is certain that the global mean surface temperature (GMST) has increased since the late nineteenth century and virtually certain that maximum and minimum temperatures over land have increased on a global scale since 1950. Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-twentieth century. Additional near-term warming is inevitable due to the thermal inertia of the oceans and ongoing GHG emissions, and the GMST is expected to continue rising over the twenty-first century under all of the projected scenarios. Climate change will impact regions differently and warming will not be equally distributed. Data indicate that in the region encompassing southern Colorado and New Mexico, average temperatures rose just under 0.7 degrees Fahrenheit per decade between 1971 and 2011, which is approximately double the global rate of temperature increase. Climate modeling suggests that average temperatures in this region may rise by 4 to 6 degrees Fahrenheit by the end of the twenty-first century, with warming increasing from south to north. By 2080–2090, the southwestern United States will see a 10% to 20% decline in precipitation, primarily in winter and spring, with more precipitation falling as rain. A recent Bureau of Reclamation report made the following projections through the end of the twenty-first century for the Upper Rio Grande Basin (southern Colorado to central-southern New Mexico) based on the current and predicted future warming:

- There will be decreases in overall water availability by one-quarter to one-third.
- The seasonality of stream and river flows will change with summertime flows decreasing.
- Stream and river flow variability will increase. The frequency, intensity, and duration of both droughts and floods will increase (BLM 2020b).

The natural greenhouse effect is critical to the discussion of climate change. The greenhouse effect refers to the process by which GHGs in the atmosphere absorb heat energy radiated by Earth's surface. Water vapor is the most abundant GHG, followed by CO_2, methane (CH_4), nitrous oxide (N_2O), and several other trace gases. These GHGs trap heat that would otherwise be radiated into space, causing Earth's atmosphere to warm and making temperatures suitable for life on Earth. Water vapor is often excluded

from the discussion of GHGs and climate change since its atmospheric concentration is largely dependent upon temperature rather than emissions by specific sources. The two primary GHGs associated with the oil and gas industry are CO_2 and CH_4. Because CH_4 has a global warming potential that is 21 to 28 times greater than the warming potential of CO_2, the EPA uses measures of CO_2 equivalent (CO_2e), which take the difference in warming potential into account for reporting GHG emissions (BLM 2020b). Oil and gas field production activities do not substantially contribute to N_2O levels and are therefore not included in estimating potential direct emissions in this EA.

Table 3.6 shows 2016 annual estimated GHG emissions for the United States, New Mexico, and the major oil and gas basins of New Mexico. Emissions are expressed in metric tons of CO_2e. Table 3.7 shows historical annual estimated GHG emissions for the United States, New Mexico, and the production (downstream impacts) associated with major oil and gas basins of New Mexico. Emissions are expressed in metric tons of CO_2e.

Table 3.6. 2016 Estimated Annual GHG Emissions from Oil and Gas Field Production (Operations)

Annual GHG Emissions	CO_2e (metric tons/year)	U.S. Emissions (%)	New Mexico Oil and Gas Emissions (%)
Total U.S GHG emissions from all sources	6,511,300,000	100	NA
Total U.S. GHG emissions from oil and gas field production	164,400,000	2.52	NA
Total New Mexico emissions from oil and gas field production	6,794,108	0.10	100.00
Total oil and gas emissions from federal production in New Mexico	3,955,124	0.06	58.21
Federal emissions in San Juan Basin from oil and gas field production (16,139 wells) *	1,678,942	0.03	24.71

* Includes federal mineral development in McKinley, Rio Arriba, Sandoval, and San Juan Counties (BLM 2020b).

Source: BLM (2020e).

Table 3.7. Historical Oil and Gas Production (Downstream/End Use)

Oil and Gas Production	2014	2015	2016	2017	2018
U.S. oil production (Mbbl)	3,196,889	3,442,188	3,232,025	3,413,376	4,011,521
New Mexico oil production (Mbbl)	125,021	147,663	146,389	171,440	248,958
PDO oil production (Mbbl)	62,007	73,344	74,810	76,307	122,032
BLM Mancos Gallup planning area oil production (Mbbl)	5,755	8,457	6,889	5,980	5,089
U.S. gas production (MMcf)	25,889,605	27,065,460	26,592,115	27,291,222	30,438,588
New Mexico gas production (MMcf)	1,140,626	1,151,493	1,139,826	1,196,514	*
BLM Mancos Gallup planning area gas production (MMcf)	245,550	281,713	287,347	293,094	476,405
FFO gas production (MMcf)	664,211	642,211	596,747	464,709	437,926
GHG Emissions					
Total U.S. oil and gas GHG emissions (MMT CO2e)	2,791.29	2,961.11	2,844.84	2,961.08	-
Total New Mexico oil and gas GHG emissions (MMT CO2e)	116.17	126.50	125.32	139.19	-
Total PDO oil and gas GHG emissions (MMT CO2e)	40.10	46.95	47.89	48.85	-

Oil and Gas Production	2014	2015	2016	2017	2018
Total BLM Mancos Gallup planning area oil and gas GHG emissions (MMT CO2e)	38.82	38.78	35.62	28.00	-

Source: BLM (2019a).

Mbbl = thousand barrels of oil

PDO = Pecos District Office

*=Data total for PDO, FFO includes data from both federal and mixed exploratory land classes.

– = Data not available for 2018 (BLM 2020b).

3.2.2 Environmental Impacts- No Action

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. No resulting impact to GHG emissions would occur.

3.2.3 Environmental Impacts- Proposed Action

3.2.3.1 METHODOLOGY AND ASSUMPTIONS

Oil and Natural Gas Development and Production Emissions Estimates

Well Development - Appendix J describes the phases associated with oil and gas development. As noted in the appendix, the construction phase includes development of the well pad, roads, and associated infrastructure such as reserve pits, pipelines, or fracturing ponds; well drilling and completion, which may include flaring. Based on past experience within oil and gas development in New Mexico, the BLM has determined that construction of an oil well would result in 525.31 metric tons CO_2e; and construction of a gas well would result in 1,021.59 metric tons CO_2e (BLM 2020e). The difference between the emissions associated with oil and gas wells is largely associated with the need for additional venting during well completion.

Field Production (Operations) - Emissions from operations include well workover operations (exhaust and fugitive dust), well site visits for inspection and repair, recompletion traffic, water and oil tank traffic, venting, compression and well pumps, dehydrators, and compression station fugitives. Based on past experience, the BLM has determined that the operation of an oil well in the FFO is estimated to result in 324.99 metric tons of CO_2e; operation of a gas well would result in 93.98 metric tons of CO_2e (BLM 2020e).

Oil and Gas Production (Downstream/End Use) Emissions Estimates - Estimates of downstream/end use GHG emissions are dependent on projected oil and gas production volumes. The BLM does not direct or regulate the end use of produced oil and/or gas. The challenge for estimating downstream emissions comes with understanding when and how oil and gas would be distributed and used for energy. It can though be reasonably assumed that the oil and gas produced from the Proposed Action will be combusted for energy consumption and use. End uses of hydrocarbons extracted from the potential development of the Proposed Action could include the combustion of transportation fuels, fuel oils for heating and electricity generation, the production of asphalt and road oil, and the manufacturing of chemicals, plastics, and other synthetic materials. The BLM can only provide an estimate of potential GHG emissions using national approximations of where or how the end use may occur.

The BLM has used a method of calculating downstream GHG emissions based on estimated production data developed for the Proposed Action. GHG combustion emission factors, metric tons/bbl and metric

tons/thousand cubic feet (mcf) for oil and gas, respectively, were applied to production volumes and converted to metric tons of CO_2 and CH_4. A global warming potential was then applied to CH_4, and finally, a conversion to metric tons of CO_{2e} was made. GHG combustion emission factors for natural gas and petroleum were obtained from 40 CFR 98 (a) and (c). Global warming potentials align with the Intergovernmental Panel on Climate Change (IPCC) and EPA 100-year global warming potentials.

3.2.3.2 IMPACTS ANALYSIS

Potential effects from GHG emissions would occur from any oil and gas development of the Proposed Action. These GHG emissions would contribute to documented ongoing and reasonably foreseeable climate-related effects. As discussed in Section 3.2.1, these effects include the following: long-term global temperature change; intensified droughts impacting agricultural, rural, and urban communities and resulting in changes in land cover and land use; intensified and more frequent wildfires; sea level rise, ocean warming, and reduced ocean oxygen impacting global weather patterns, flora, and fauna; intensified flooding impacting infrastructure, natural resource–based livelihoods, and cultural resources; and human health, such as heat-associated deaths and illnesses, chronic diseases, and other health issues associated with poor air quality (Gonzalez et al. 2018).

GHG emissions from the potential future development of the Proposed Action include emissions from development of any potential wells detailed in the APDs, production associated with the wells, and downstream/end use emissions from the consumption of oil and natural gas products.

Well Development and Field Production (Operations) - Table 3.8 presents annual GHG emissions associated with development and field production (operations) of the proposed Nageezi Units 2309 and 2409 Cluster oil wells, assuming full development of the APDs.

Table 3.8. Estimated Annual GHG Emissions from Development and Production of the Proposed Action

Annual GHG Emissions	CO_2e (metric tons)	All U.S. Annual Emissions (%)	Annual New Mexico Oil and Gas Production Emissions
Well Development (16 oil wells, Year 1 only)	8,405	0.00013	0.008
Well Field Production (Operations) (16 wells)	5,196	0.00008	0.005
Total	**13,601**	**0.00021**	**0.013**

Using the average annual oil and gas development emissions value of approximately 525.31 metric tons of CO_2e per oil well in the San Juan Basin of New Mexico (see *Well Development)* and multiplying by number of wells (16) yields an estimate of 8,405 metric tons CO_2e of annual GHG emissions from the Proposed Action, assumed to occur only in year 1. Using the average annual oil and gas production emissions value of approximately 324.77 metric tons of CO_2e per oil well in the San Juan Basin of New Mexico (see *Well Development)* and multiplying by number of wells (16) yields an estimate of 5,196 metric tons CO_2e of annual GHG emissions from the Proposed Action, assumed to occur for the life of the well. Together, well development and production emissions would result in 13,601 metric tons CO_2e in year 1, an increase of 0.00021% in the total annual U.S. GHG emissions and 0.013% of the total annual GHG emissions from oil and gas production in New Mexico (see Table 3.8). If well construction were to be spread out over multiple years, annual GHG emissions during those years would be lower than the total of 13,601 metric tons CO_2e that is reported in Table 3.8 but higher than the operations subtotal of 5,196 metric tons CO_2e. Over the life of the 16 oil wells, the total emissions from combined construction

(during the first year) and operation over an assumed well life-span of 20 years would be 112,325 metric tons CO_2e.

Downstream/End Use (Indirect) - Potential downstream/end use GHG emissions from full development of the Nageezi Units 2309 and 2409 Cluster oil wells are estimated using oil and gas production values. DJR estimates that each well will result in an average of 300 bbl of oil and 1,200 mcf of natural gas per day; the total average of oil and gas production for 16 wells will be 4,800 bbl of oil per day and 19,200 mcf of natural gas per day. Assuming a 20-year well life translates to 2,190,000 bbl of oil and 8,760,000 mcf of natural gas per well or 35,040,000 bbl of oil and 140,160,000 mcf of natural gas for all 16 wells.

Table 3.9. Estimated Downstream/End Use (Indirect) GHG Emissions for the Proposed Action

Proposed Action Product	Emission Factors	Estimated Product Quantity	Estimated Emissions (million metric tons CO_2e)
Crude Oil (bbl)	0.43 metric ton CO_2/bbl	35,040,00	15,067,200
Natural Gas (mcf)	0.055 metric ton CO_2/mcf	140,160,000	7,708,800
Total		–	22,776,000

Source EPA (2020e)

3.2.4 Cumulative Impacts

The 2019 Air Resources Technical Report (incorporated by reference), Section 10.6, details recent trends of GHG emissions by sector. Within the fossil fuel combustion sector, the contribution by fuel type shows that petroleum represents 44.7% of the fuel type, natural gas 29.5%, and coal 25.8% (BLM 2020b).

In 2017, the BLM commissioned a climate change report with an energy focus. The report calculates GHG emissions associated with production and consumption activities related to coal, oil, natural gas, and natural gas liquids. The baseline year is 2014 and forecasts production/consumption GHG emissions for 2020 and 2030 for federal and non-federal land on a national level and for 13 energy-producing states, not limited to New Mexico, Oklahoma, Texas, and Kansas. Inputs for the report were developed using publicly available online information from such sources as the U.S. Energy Information Administration, EPA's *Greenhouse Gas Inventory Report: 1990–2014* (EPA 2016), U.S. Department of the Interior Office of Natural Resources Revenue, U.S. Extractive Industries Transparency Initiative, BLM oil and gas statistics, and others as applicable to each state. More information on the methodology and assumptions, as well as other data sources for all 13 states, is in the *Greenhouse Gas and Climate Change Report, 2017* (Golder Associates 2017), which is herein incorporated by reference.

In November of 2018, the U.S. Geological Survey (USGS) published a scientific investigation report, *Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates 2005-2014* (Merrill et al. 2018). The 2019 Air Resources Technical Report summarizes this information and separates emissions by mineral and discloses relative percentages relative to national and worldwide GHG emissions. In 2014, end-use combustion and extraction of fossil fuels produced on New Mexico federal land was 91.63 MMT CO_2e. This value is comparable with the 2014 baseline reported value of 93.72 MMT CO_2e as reported by Golder Associates (2017). The 2014 baseline for the 13 states evaluated in the Golder Associates report is 1,275.53 MMT CO_2e, compared with an estimated 1,332 MMT CO_2e in the USGS report (Merrill et al. 2018). The values from USGS and Golder Associates include emissions from the combustion of coal, oil, and natural gas from fossil fuels produced on federal land as well as extraction emissions from activities occurring on federal land.

For the purposes of this analysis, BLM uses projections of the total federal and non-federal oil and gas emissions from Golder Associates (2017) to estimate expected annual future GHG emissions from energy production and consumption activity within a subnational region, including New Mexico, Oklahoma, Kansas, and Texas, which the BLM New Mexico State Office (NMSO) has jurisdiction over. Assumptions of the analysis are discussed in Golder Associates 2017. The following are key assumptions:

- State-specific oil consumption is equal to state total production minus export and reserves for the state based on national averages.
- National averages for sector breakdown percentages (power, industrial, etc.) for oil, natural gas, and natural gas liquids consumptions were applied to state-specific data.
- The value of production and consumption on non-federal land is equal to the difference of the total state or national value minus the federal land value.

At the state level, production does not necessarily translate to 100% consumption of the fossil fuel but is representative of future energy consumption and production to show GHG emissions. The development projected in the RFDs for each BLM field office under NMSO jurisdiction (such as the 2016 RFD for the Pecos District Office (PDO); see Engler and Cather 2012, 2014) are considered in these data. Current and future lease sales are part of each RFD. Because the BLM NMSO has control over lease sales in this area, for NEPA disclosure purposes, this section provides a discussion of reasonably foreseeable cumulative production and consumption within these states and discloses the magnitude of GHG emissions likely to result from BLM NMSO lease sale activities on an annual basis. This information is further contextualized by comparing the relative magnitude of these emission with projected national and global annual GHG emission rates.

New Mexico Coal, Oil, and Gas GHG Emissions

BLM's New Mexico reasonably foreseeable coal, oil, and gas production and consumption GHG emissions from federal activities are 95.09 MMT CO_2e for the 2020 high scenario and 99.35 MMT CO_2e for the 2030 high scenario (Table 3.10). These represent increases of 2.5% and 7.2%, respectively, from the 2014 baseline coal, oil, and gas GHG emissions (92.75 MMT CO_2e). New Mexico federal coal, oil, and gas GHG emissions of 95.09 (2020 high scenario) and 99.35 (2030 high scenario) MMT CO_2e/year would represent 49% and 52% of state 2020 and 2030 high reasonably foreseeable coal, oil, and gas GHG emissions (Table 3.10).

Table 3.10. Reasonably Foreseeable Coal, Oil, and Gas Production and Consumption GHG Emissions, BLM New Mexico, Oklahoma, Kansas, and Texas

GHG Emissions (MMT CO_2e per year)					
Category	**New Mexico**	**Oklahoma**	**Kansas**	**Texas**	**NM, OK, KS, TX**
2020 High Scenario					
Federal coal	13.89	1.25	0	0	15.14
Federal oil	25.49	0.33	0.08	0.06	25.95
Federal gas	49.60	0.96	0.29	2.40	53.25
Federal natural gas liquids	6.11	0.09	0.05	0.04	6.29
Total Federal	**95.09**	**2.63**	**0.42**	**2.50**	**100.64**
Federal + non-federal coal	43.12	1.87	0.13	97.46	142.58
Federal + non-federal oil	55.28	56.72	22.10	518.06	652.16

GHG Emissions (MMT CO_2e per year)					
Category	**New Mexico**	**Oklahoma**	**Kansas**	**Texas**	**NM, OK, KS, TX**
Federal + non-federal gas	83.28	152.16	18.14	694.29	947.87
Federal + non-federal natural gas liquids	12.14	20.09	3.14	84.14	119.51
Total federal and non-federal	**193.82**	**230.84**	**43.51**	**1,393.95**	**1,862.12**
2030 High Scenario					
Federal coal	10.14	0.91	0	0	11.05
Federal oil	25.60	0.33	0.08	0.06	26.07
Federal gas	57.44	1.11	0.34	2.78	61.67
Federal natural gas liquids	6.17	0.09	0.05	0.04	6.35
Total Federal	**99.35**	**2.44**	**0.47**	**2.88**	**105.14**
Federal + non-federal coal	31.52	1.37	0.1	71.12	104.11
Federal + non-federal oil	55.51	56.95	22.19	520.20	654.85
Federal + non-federal gas	96.45	176.21	21.02	804.05	1,097.72
Federal + non-federal natural gas liquids	12.25	20.27	3.17	84.88	120.57
Total federal and non-federal	**195.73**	**254.8**	**46.47**	**1,480.25**	**1,977.25**

Note: Totals may not sum exactly due to rounding.

Source: Golder Associates (2017).

Oklahoma Coal, Oil, and Gas GHG Emissions

BLM's Oklahoma reasonably foreseeable coal, oil, and gas production and consumption GHG emissions from federal activities are 2.63 MMT CO_2e for the 2020 high scenario and 2.44 MMT CO_2e for the 2030 high scenario (see Table 3.10). This is a decrease of 1.9% and an increase of 8.9%, respectively, from the 2014 baseline coal, oil, and gas GHG emissions (2.68 MMT CO_2e). Oklahoma federal coal, oil, and gas GHG emissions of 2.63 MMT (2020 high scenario) and 2.44 (2030 high scenario) MMT CO_2e/year would represent 1.14% and 0.96%, respectively, of state 2020 and 2030 high reasonably foreseeable GHG emissions from coal, oil, and gas activities (see Table 3.10).

Kansas Coal, Oil, and Gas GHG Emissions

BLM's Kansas reasonably foreseeable coal, oil, and gas production and consumption GHG emissions from federal activities are 0.42 MMT CO_2e for the 2020 high scenario and 0.47 MMT CO_2e for the 2030 high scenario (see Table 3.10). These values represent increases of 5.0% and 17.5%, respectively, compared with the 2014 baseline coal, oil, and gas GHG emissions (0.40 MMT CO_2e). Kansas federal coal, oil, and gas GHG emissions of 0.42 (2020 high scenario) and 0.47 (2030 high scenario) MMT CO_2e/year would represent 0.97% and 1.01%, respectively, of state 2020 and 2030 high reasonably foreseeable GHG emissions from coal, oil, and gas activities (see Table 3.10).

Texas Coal, Oil, and Gas GHG Emissions

BLM's Texas reasonably foreseeable coal, oil, and gas production and consumption GHG emissions from federal activities are 2.50 MMT CO_2e for the 2020 high scenario and 2.88 MMT CO_2e for the 2030 high scenario (see Table 3.10). These are increases of 4.2% and 20.7%, respectively, compared with the 2014 baseline coal, oil, and gas GHG emissions (2.40 MMT CO_2e). Texas federal coal, oil, and gas GHG

emissions of 2.50 (2020 high scenario) and 2.88 (2030 high scenario) MMT CO_2e/year would represent 0.18% and 0.19%, respectively, of state 2020 and 2030 high reasonably foreseeable GHG emissions from coal, oil, and gas activities (see Table 3.10).

Although a NEPA document may present quantified estimates of potential GHG emissions associated with reasonably foreseeable energy development, there is uncertainty with regard to eventual production volumes and variability, flaring, construction, transportation, etc. A rough estimate was possible using publicly available information and estimates from future production for RFD. Also, there is uncertainty with regard to the net effects of reasonably foreseeable energy development on climate; that is, while BLM actions may contribute to the climate change phenomenon, the specific effects of those actions on global climate are speculative given the current state of the science. Inconsistencies in the results of scientific models designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts of decisions made at this level and to determine the significance of any discrete amount of GHG emissions beyond the limits of existing science.

Cumulative Climate Change Impacts

Changes in climate are generally measured over long time periods to avoid the influence of meteorological or climatic cycles occurring on shorter time scales (e.g., inter-annual variability). While climate change projections are available for different regions, the climate impacts from GHGs are a global issue.

Golder Associates (2017: Section 4.0) discusses future climate projections, including four representative concentration pathways (RCPs) as identified by the IPCC: RCP 2.6, 4.5, 6.0, and 8.5. The RCP scenarios were developed based on representative GHG emission scenarios including varying assumptions regarding levels of cumulative global GHG emissions over time. RCP 8.5 assumes increasing GHG emissions over time, with no stabilization, and is meant to be representative of scenarios leading to high GHG concentration levels. RCP 4.5 and RCP 6.0 represent scenarios for which GHG emissions are reduced over time through climate policy. RCP 2.6 represents a scenario for which drastic action is taken through stringent climate policy and substantial GHG emission reductions are achieved over time. The pathways are named after the radiative forcing (defined as the difference between insolation [sunlight] absorbed by the Earth and energy radiated back to space) projected to occur by 2100 (e.g., RCP 8.5 would be projected to result in 8.5 W/m^2 radiative forcing by 2100). The radiative forcing of the atmosphere in each pathway is driven by the concentration of GHGs accumulated in the atmosphere. The RCP characterizations and regions are further described by Golder Associates (2017: Section 4.1).

Climate change is driven by radiative forcing, which is influenced by cumulative GHG emissions, not annual emission rates from any given subnational project. Figure 3.1 shows a comparison of global cumulative emissions in relation to RCPs 2.6, 4.5, and 8.5, representing low, medium, and high global cumulative emissions scenarios.

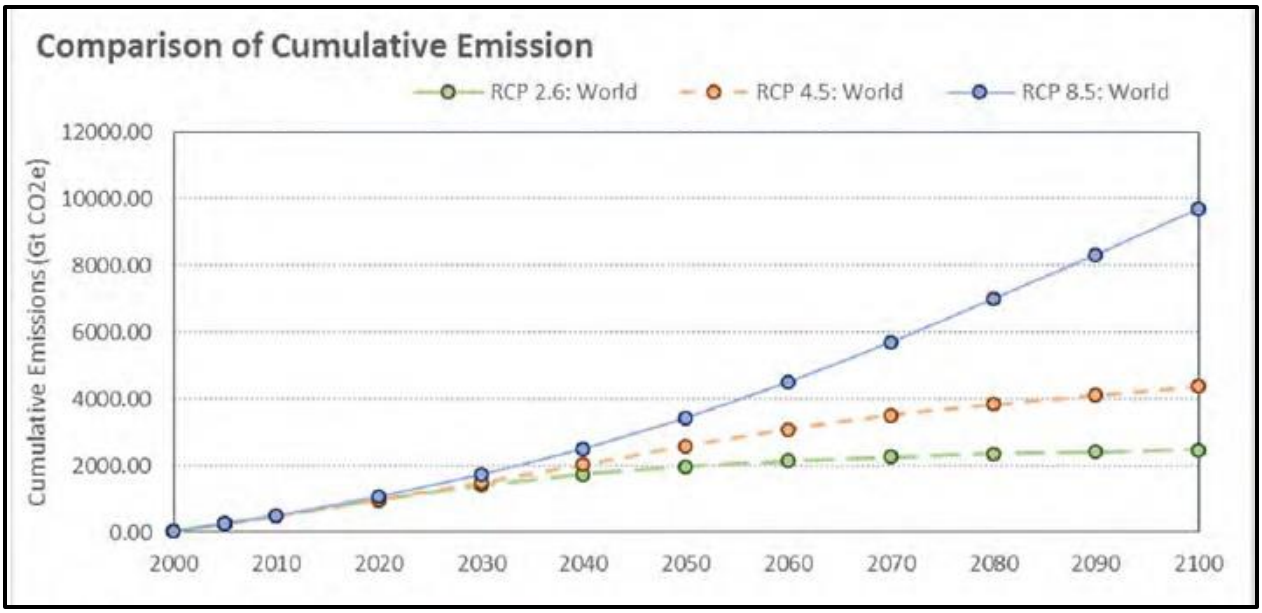

Figure 3.1. Comparison of RCP 2.6, RCP 4.5, and RCP 8.5 cumulative emission estimates over the twenty-first century.

When considering the cumulative emissions on a global scale, the annual emission rates of various subnational projects are one of many emission contributions. Any single contribution on a subnational scale is dwarfed by the large number of comparable national and subnational contributors on a global scale. However, the best surrogate for understanding the potential impact of BLM's subnational scale emissions on climate is estimating projected annual emission rate due to BLM energy lease sale projects. Golder Associates (2017) provides projections of GHG emissions from the 13 western states that regulate most of the federal fossil fuel leasing and compares these emissions with GHG emissions from other contributors. To accomplish this comparison, Golder Associates demonstrates a comparison of the projected BLM annual emission rates derived from federal lease sale and production information from the 13 western states and compares them with the RCP scenario emissions profile (a derived value estimating the annual GHG emission rate for each scenario). This comparison is provided in Figure 3.2.
For additional context, 2014 baseline year federal resource production and consumption estimates for these 13 states can be compared with the 2014 baseline national energy consumption and total GHG emissions. BLM subnational emissions in these 13 states are approximately 25.97% of the total national energy consumption emissions and 19.75% of national GHG emission totals at 2014 levels. In 2014, federal mineral production and consumption emissions in these 13 states represented approximately 2.64% of the global totals from all emission sources. With the relative magnitude of these emissions in mind, climate change trends and impacts are discussed below.

The contribution of GHG emissions from coal, oil, natural gas, and liquefied natural gas for the 13 BLM subject states in 2020 and 2030 under both normal and high production scenarios were evaluated and compared with the GHG emissions profile (the derived annual emission rate for the three RCP scenarios shown in Figure 3.2). By comparing the relative emission rates of the derived ranges of BLM emissions profiles (low and high estimates) with the RCP scenarios, the BLM emissions most closely track with RCP 8.5 in 2020 and between RCP 2.6 and RCP 4.5 in 2030 (Golder Associates 2017). The reduction in BLM's emissions profile in 2030 compared with 2020 is a result of a projected change to the federal energy resource mixture. Less coal development is projected, while a slight increase in oil, gas, and natural gas liquids are projected into 2030 relative to 2020. Because coal is the most GHG-intensive fossil

fuel, the reduction in this resource development is anticipated to reduce BLM's lease sale emissions profile (annual GHG emission rate) overall (see Figure 3.2).

Based on the analysis in Golder Associates (2017), BLM activities are estimated to be conducted at a level that would be in line with the level of emissions anticipated in RCP 2.6 and RCP 4.5 through 2060. Estimates of BLM activities in future years are more uncertain and have a wider range of variability. The projections presented above are based on best available data and assumptions used to provide context to BLM's cumulative impact. However, due to the levels of uncertainty, some additional information is provided below regarding BLM's relative contribution to global emissions and, by proxy, climate change. If the BLM operates under the business-as-usual scenario while all other contributors are reducing their emissions in line with RCP 2.6, the relative contribution of BLM increases as the emissions more closely resemble RCP 4.5. If the BLM operates under the decreased emissions scenario, keeping their reductions in line with RCP 2.6 like all the other contributors, the relative contribution of BLM remains similar to current contributions. If BLM operates under the decreased emissions scenario while all other contributors are maintaining constant emissions (business-as-usual) or increasing emissions, the relative contribution of BLM greatly reduces. It is very unlikely that the global cumulative emissions will be strongly influenced by a single contributor at a national or subnational scale. However, the individual behavior of each contributor, through its relative contribution, has the ability to influence which RCP global emissions scenario is most closely resembled and, therefore, which climate change projections are most likely manifested toward the end of the century (Golder Associates 2017).

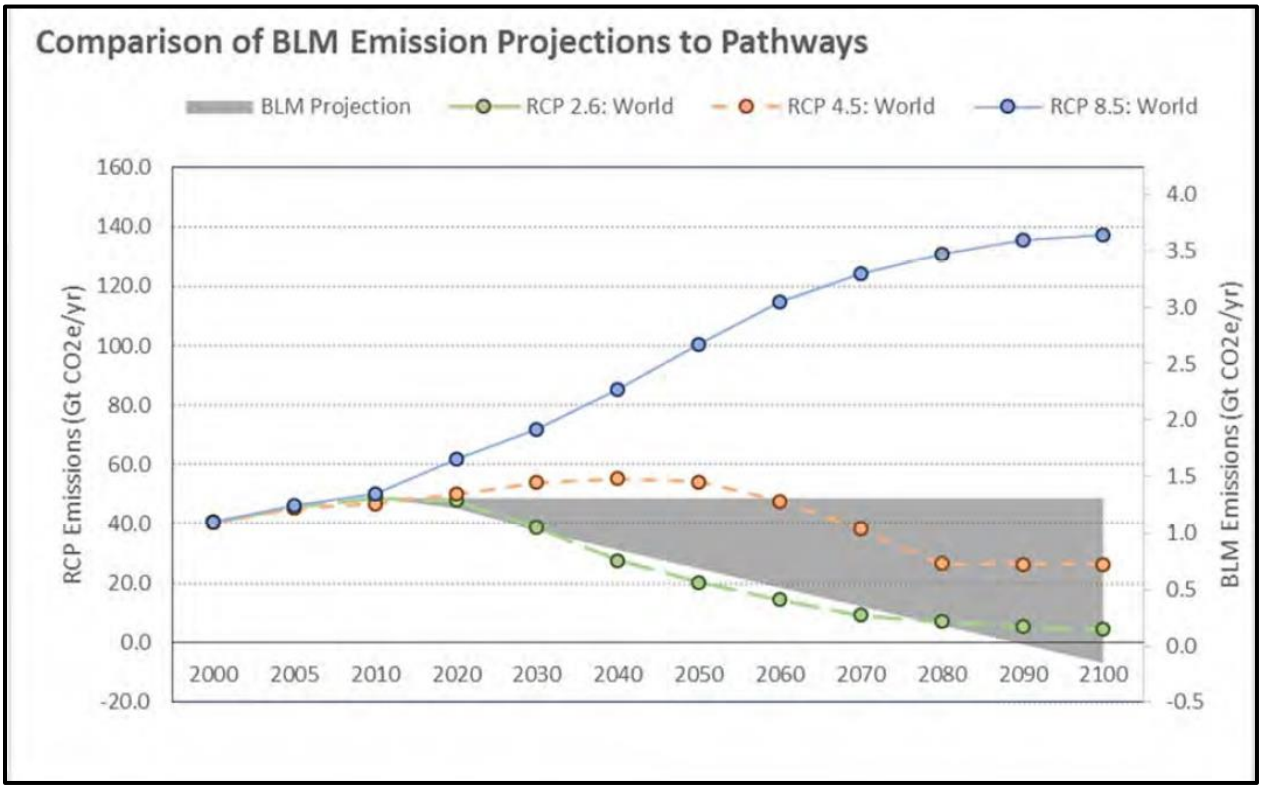

Figure 3.2. Comparison of BLM emission projections with RCP 2.6, RCP 4.5, and RCP 8.5.

To understand the impacts of climate change, three RCP scenario projections of global temperature and precipitation changes in both the near term (representing the period from 2021 through 2040) and far term (representing the period from 2081 through 2100) are presented in Table 3.11. These estimates are

derived from the average of over 30 different climate change models using the inputs of each RCP scenario.

Table 3.11. Projected Changes in Climate under Representative Concentration Pathways

RCP Pathway	Near Term		Far Term	
	Temperature (°C)	Precipitation (%)	Temperature (°C)	Precipitation (%)
RCP 2.6	0.78	1.44	0.97	2.27
RCP 4.5	0.85	1.49	1.81	3.51
RCP 8.5	0.98	1.62	3.68	5.89

Under each RCP scenario, projected average global temperatures are expected to increase and changes in precipitation are anticipated. However, generally, the impacts of climate change are least severe under the RCP 2.6 scenario and most severe under the RCP 8.5 scenario. Regardless of the specific magnitude of the impacts, the impacts on global climate are anticipated to include

- long-term global temperature change;
- intensified droughts impacting agricultural, rural, and urban communities and resulting in changes in land cover and land use;
- intensified and more frequent wildfires;
- sea level rise, ocean warming, and reduced ocean oxygen, impacting global weather patterns and flora and fauna;
- intensified flooding impacting infrastructure, natural resource–based livelihoods, and cultural resources; and
- human health, such as heat-associated deaths and illnesses, chronic diseases, and other health issues associated with poor air quality (Gonzalez et al. 2018).

To understand climate change impacts in the analysis area of the Proposed Action, impacts anticipated in the region encompassing southern Colorado and New Mexico are discussed. Climate modeling suggests that annual average temperatures in this region may rise by 4 to 6 degrees Fahrenheit by the end of the twenty-first century, with warming increasing from south to north. By 2080–2090, the southwestern United States would see a 10% to 20% decline in precipitation, primarily in winter and spring, with more precipitation falling as rain. A recent Bureau of Reclamation report (2013, as cited in BLM 2020b) made the following projections through the end of the twenty-first century for the Upper Rio Grande Basin (southern Colorado to central-southern New Mexico) based on the current and predicted future warming:

- There would be decreases in overall water availability by one-quarter to one-third.
- The seasonality of stream and river flows would change, with summertime flows decreasing.
- Stream and river flow variability would increase. The frequency, intensity, and duration of both droughts and floods would increase (BLM 2020b).

The Bureau of Reclamation report also noted that reduction in water is expected to make environmental flows in the Upper Rio Grande system more difficult to maintain and reduce the shallow groundwater available to riparian vegetation. Both of these impacts have implications for the habitat of fish and wildlife in the Upper Rio Grande Basin riparian ecosystems (Bureau of Reclamation et al. 2013). A U.S.

Forest Service assessment of 117 species of birds, reptiles, amphibians, and mammals along the Middle Rio Grande in New Mexico (Friggens et al. 2013, as cited in Bureau of Reclamation et al. 2013) projected decreasing availability of riparian habitat and loss of mature trees due to fire and disease that would directly and indirectly affect many species of birds and mammals. Most evaluated species were projected to experience negative effects from climate change; however, a few species, such as coyotes, jackrabbits, some lizards, and roadrunners, may benefit from conversion of the bosque to a more sparsely vegetated and drier habitat (Friggens et al. 2013, as cited in Bureau of Reclamation et al. 2013).

3.2.5 Mitigation and Residual Effects

The BLM best management practices are designed to reduce impacts on air quality (see Issue 1) and reduce CH_4 and GHGs. In addition, the BLM encourages industry to participate in the Natural Gas STAR program that is administered by the EPA. The Natural Gas STAR program is a flexible, voluntary partnership that encourages oil and natural gas companies to adopt proven, cost-effective technologies and practices that improve operational efficiency and reduce natural gas emissions (EPA 2006). Adoption of the Natural Gas STAR program would likely significantly reduce CO_2e emissions since the program is particularly focused on reducing CH_4, which has a high global warming potential. However, adoption of Natural Gas STAR Program best practices would reduce but not eliminate GHG emissions.

The EPA has New Source Performance Standards (NSPS) (codified in 40 CFR 60) in place to reduce CH_4 emissions from oil and gas sources. NSPS OOOOa requires reduction of VOCs and CH_4 from well completion operations from new or re-fractured hydraulically fractured wells and a requires reduction of storage tank emissions by 95% for tanks constructed after September 18, 2015, with emissions greater than 6 tons per year of VOC (this has the co-benefit of reducing CH_4 emissions as well). NSPS OOOOa also imposes stringent semiannual leak detection and repair requirements for the collection of fugitive emission components at well sites constructed after September 18, 2015. NSPS OOOOa also requires scheduled maintenance and/or emission control devices for reciprocating and centrifugal compressor venting at compressor stations and includes provisions to limit emissions from natural gas pneumatic devices and pumps. These provisions aim to reduce fugitive emissions of CH_4 at oil and gas facilities. The NMED and New Mexico Energy, Minerals and Natural Resources Department (EMNRD) are each in the process of developing rules that will regulate CH_4 emissions. The departments were charged with this task under the Executive Order on Addressing Climate Change and Energy Waste Prevention of Gov. Michelle Lujan Grisham. The order instructs NMED and EMNRD to "jointly develop a statewide, enforceable regulatory framework to secure reductions in oil and gas sector methane emissions and to prevent waste from new and existing sources and enact such rules as soon as practicable" (NMED 2019).

3.3 Issue 3: How would future drilling and completion operations associated with the Proposed Action impact groundwater quality and quantity?

3.3.1 Affected Environment

The following analysis summarizes information contained in the *2019 BLM New Mexico Water Support Document*, hereafter referred to as the Water Support Document (BLM 2019a). The analysis area established to analyze impacts on water quality and quantity is the New Mexico portion of the San Juan Basin (which encompasses San Juan, McKinley, Rio Arriba, and Sandoval Counties), where water use associated with oil and gas development is mostly likely to occur and which represents the highest potential for oil and gas development in the BLM FFO region. The 2018 RFD scenario states that "unless significant new oil and gas discoveries are made in the area, future activity will be primarily horizontal

drilling for oil in the Mancos-Gallup play, with minor development targeted at natural gas production" (Crocker and Glover 2018:2).

3.3.1.1 CURRENT TOTAL WATER USE IN THE ANALYSIS AREA

The 2018 USGS report, Estimated Use of Water in the United States in 2015 (Dieter et al. 2018), lists total water withdrawals across eight water use categories: aquaculture, domestic, industrial, irrigation, livestock, mining, public water supply, and thermoelectric power. Within the New Mexico portion of the San Juan Basin, total water use in 2015 was estimated at 486,660 acre-feet (AF) (15% of total state withdrawals). About 10% of this total (or 50,008 AF) came from groundwater. The largest water use categories in the New Mexico portion of the San Juan Basin are irrigation (79%), followed by public water supply (8%). Two (2) percent (11,658 AF per year) of 2015 total water use in the New Mexico portion of the San Juan Basin is attributable to mining (the category under which oil and gas operations are reported), all of which comes from groundwater sources.

Water Use for Oil and Gas Development

As part of oil and gas development, water is used for drilling fluid preparation and make-up water for completion fluids, in well stimulation (of which the most common method is hydraulic fracturing), as rig wash water, as coolant for internal combustion engines, for dust suppression on roads or well/facility pads, and for equipment testing. Water use associated with hydraulic fracturing of wells, which comprises the majority of water use, is dependent on many factors, including the target geologic formation and design of the hydraulic fracturing job. On average, the water use associated with hydraulic fracturing for vertical wells in the New Mexico portion of the San Juan Basin is 0.537 AF per well (Crocker and Glover 2018). Horizontal wells require more water than vertical wells for well completion. The 2018 RFD (Crocker and Glover 2018) reported that horizontal wells in the New Mexico portion of the San Juan Basin require on average approximately 3.13 AF of water. However, recent studies using 2014–2018 data from FracFocus (a national hydraulic fracturing chemical registry managed by the Ground Water Protection Council and Interstate Oil and Gas Compact Commission) show that water use for hydraulic fracturing of oil and gas wells in the New Mexico portion of the San Juan Basin has increased from 320 AF in 2014 to 643 AF in 2018 (FracFocus 2019). Analysis of 2018 FracFocus data for the New Mexico portion of the San Juan Basin resulted in a value of 4.84 AF of water per horizontal well, which BLM considers to be the most accurate estimate of current water use for hydraulic fracturing of a horizontal well in the New Mexico portion of the San Juan Basin. Beginning in 2015, the BLM FFO began receiving APDs that included new technologies that utilize greater quantities of water during the stimulation of the well under development, such as slick water stimulation. To date, 20 wells have been drilled using long laterals with slick water stimulation within the BLM FFO region. Based on water use information for these wells obtained from FracFocus and lateral length information obtained from the well APDs, the BLM has calculated a water use average of 27 AF per lateral mile. Additional information on estimated water use for slick water stimulation is contained in the Water Support Document (BLM 2019a).

Water Sources and Water Quality

The geologic setting of the San Juan Basin is highly stratified and complex. There are 10 major confined aquifers in the San Juan Basin: Morrison Formation, Ojo Alamo Sandstone, Pictured Cliffs Sandstone, Cliff House Sandstone, Menefee Formation, Kirtland Shale/Fruitland Formation, Point Lookout Sandstone, Gallup Sandstone, Dakota Sandstone, and Entrada Sandstone. Water yields in these formations vary, with Cenozoic (younger) aquifers in the San Juan Basin (such as the Ojo Alamo Sandstone, the Nacimiento Formation, and the San Juan Formation) having potential to produce water at a rate of 100 gallons per minute; however, in general, most aquifers yield less than 20 gallons per minute

(BLM 2019a:32, 49). In the southern portion of the San Juan Basin, water for hydraulic fracturing of oil wells comes from sources that tap the Nacimiento Formation and the Ojo Alamo Sandstone.

Groundwater quality in the San Juan Basin is variable (ranging from fresh to brackish) due to the complex stratigraphy and varying rock formations within the Basin. Brackish and saline water is typically found in the center of the Basin, and fresh groundwater is typically found along the Basin margins. Total dissolved solids (TDS) concentration is the primary indicator of groundwater quality. Higher TDS concentrations typically make water less suitable for drinking or for agricultural purposes like irrigation. In groundwater, TDS is influenced by the dissolution of natural materials such as rock, soil, and organic material. Anthropogenic activities also contribute to TDS concentrations in shallow, unconfined aquifers. TDS concentration in the San Juan Basin is dependent on the stratigraphic location and the geologic formation where the water resides. Fresh water (TDS less than 1,000 milligrams per liter [mg/l]) is typically found at depths below 2,500 feet below the ground surface, although exceptions to this generalization occur in deeper layers like the Gallup Sandstone and Morrison Formation. Saline and brackish water is dominant in the center of the Basin at deeper depths (BLM 2019a:38). The Entrada Sandstone Formation is an aquifer with TDS greater than 10,000 parts per million (ppm) (BLM 2019a:51).

San Juan Basin oil and gas operators have recently included plans to use multiple hydraulic fracturing methods including slick water fracturing technology. The higher allowable TDS levels that are acceptable for slick water stimulation expand the possible water sources beyond those that are traditionally used (e.g., surface water or groundwater) into non-traditional sources of water (e.g., non-potable groundwater sources). These include non-potable connate water (groundwater) from the Entrada Sandstone Formation, as well as "flowback fluid" and "produced water." Flowback fluid is a mixture of chemical proppant, water, and sand that flows back through the wellhead directly after stimulation activities. Produced water is naturally occurring water that exists in the formation that is being targeted for mineral extraction and is produced as a byproduct. The Water Support Document (BLM 2019a) contains additional information regarding potential water sources that may be used.

3.3.1.2 WATER DISPOSAL

Historically, more than 95% of the produced water associated with oil and gas operations has been injected into saltwater disposal wells (BLM 2015). The New Mexico Oil Conservation Division (NMOCD) regulates and monitors underground injection wells. NMOCD permits saltwater disposal wells into formations that will allow water infiltration and has TDS greater than 10,000 mg/l. The majority of current saltwater disposal wells are permitted in the Entrada Formation; however, some older saltwater disposal wells were permitted in the Mesaverde Formation. Using data from the New Mexico State Land Office, over 600 saltwater disposal wells are currently located throughout the San Juan Basin with an average depth of around 6,000 feet (BLM 2018b).

3.3.1.3 SPILLS

As noted in the Water Support Document, there have been 106 spills in the New Mexico portion of the San Juan Basin. Roughly half of all spills are not recovered but are remediated, which may include removal of contaminated soil. However, no spills occurring in the New Mexico portion of the San Juan Basin were reported as having affected surface or groundwater (BLM 2019a:35).

3.3.2 Environmental Impacts – No Action Alternative

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. No resulting impact to water quality would occur.

3.3.3 Environmental Impacts – Proposed Action

3.3.3.1 WATER QUANTITY

Under the Proposed Action, based on the depth of the Gallup Sandstone Formation (4,500 feet) and other similar DJR projects, it is estimated that that development of each well associated with the Nageezi Units 2309 and 2409 Cluster oil wells would require approximately 50,000 bbl of water or 6.44 AF for drilling and completion. Of this total, approximately 5,000 bbl (0.64 AF) of water would be used for drilling and 45,000 bbl (5.8 AF) would be used for completion (DJR 2020b). Development of all 16 Nageezi Units 2309 and 2409 Cluster oil wells would require a total of approximately 103.04 AF. Drilling and development of each well is estimated to take place over a 20-day period. DJR would use nitrogen gas fracturing technology for well completion. This is a relatively low water use completion technology (BLM 2018b). All fresh water used for pad and road construction and well drilling and completion will be trucked from the Blanco Trading Post Water Well, point of diversion authorization number SJ-2105.

Assuming all 16 wells were developed in the same year, estimated water use would comprise less than 0.005% of the 2015 San Juan Basin total water use and 0.039% of 2015 San Juan Basin total groundwater use, and would result in a 0.016% increase over 2015 water use in the mining category for the San Juan Basin (see Section 3.3.1.1). The total estimated water use for drilling and completion of 16 wells (103.40 AF) in a single year represents approximately 16% of the 2018 San Juan Basin oil and gas water use reported to FracFocus (643 AF). The percent contribution to annual water use would be lower if well development is spread out over a period of years.

3.3.3.2 WATER QUALITY

DJR would use nitrogen gas fracturing technology for well completion. Hydraulic fracturing is intended to change the physical properties of producing formations by increasing the flow of water, gas, and/or oil around the wellbore, resulting from the introduction of water, proppant (sand), and chemical additives into the producing formations. Types of chemical additives used in completion activities could include acids, hydrocarbons, thickening agents, gelling agents, lubricants, and other additives that are operator- and location-specific. The largest components in hydraulic fracturing fluid are water and sand.

The wells would most likely pass through usable groundwater aquifers currently or potentially supplying stock, residential, and/or irrigation water. Potential impacts on groundwater resources could occur if proper cementing and casing programs are not followed. This could include loss of well integrity, surface spills, or loss of fluids in the drilling and completion process, with the introduction of chemical additives to be used in drilling and completion activities to be introduced into usable water (TDS >10,000 ppm) zones. If contamination of aquifers from any source occurs, changes in groundwater quality could impact springs and water wells that are sourced from the affected aquifers. The Water Support Document contains a detailed summary of the regulatory program associated with hydraulic fracturing and measures to protect groundwater quality. Since the advent of hydraulic fracturing, more than 1 million hydraulic fracturing treatments have been conducted, with one potential documented case of direct groundwater pollution resulting from injection of hydraulic fracturing chemicals used for shale gas extraction (Gallegos and Varela 2015). There have not been any documented past instances of groundwater contamination in the analysis area attributed to well drilling (BLM 2019a). Due to DJR's adherence to NMOCD's casing, cementing, and pressure-testing requirements to prevent contamination of aquifers, it is anticipated that the proposed wells would not impact water quality.

With consideration of design features, development of the Proposed Action is not expected to affect water quality. Should a spill occur, the BLM would work with the NMOCD to immediately remediate spills on BLM land in accordance with federal and state standards, including 19.15.29.11 NMAC. See the Water Support Document (BLM 2019a) for more information on spills. Storage of the oil and liquids at the

proposed project area would increase potential for oil or produced water spills that could affect groundwater quality. See Section 2.1.1 for a list of production equipment; details of each project can be found in the APDs and SUPOs on file with the BLM FFO including design features and BMPs associated with production equipment containment.

3.3.4 Cumulative Impacts

3.3.4.1 CUMULATIVE IMPACT AREA

The analysis area established to measure cumulative impacts on water quality and quantity is the San Juan Basin (which encompasses San Juan, McKinley, Rio Arriba, and Sandoval Counties), where water use associated with oil and gas development is most likely to occur because the San Juan Basin presents the highest potential for oil and gas development in the BLM FFO area.

3.3.4.2 PAST AND PRESENT ACTIONS

Past and present water use is summarized in Section 3.3.1, Affected Environment. As noted, total water use in the counties of New Mexico comprising the San Juan Basin is 486,660 AF; mining (which includes oil and gas development) comprised about 2% of 2015 San Juan Basin water withdrawals. The largest water use category within the analysis area is agricultural irrigation, comprising 79% of all water use within the San Juan Basin.

3.3.4.3 REASONABLY FORESEEABLE FUTURE ACTIONS

Estimates for the number of oil and gas wells that could reasonably occur in the New Mexico portion of the San Juan Basin were derived from the 2018 RFD scenario, which projects 3,200 total wells (2,300 horizontal wells, 900 vertical wells) to be drilled in the New Mexico portion of the San Juan Basin between 2018 and 2037 (Crocker and Glover 2018). Future well development, such as the Nageezi Units 2309 and 2409 Cluster oil wells (described in Sections 1.1 and 2.1) that would be supported by the Proposed Action, is already considered in this scenario. Based on vertical and horizontal water use estimates contained in the 2018 RFD and refined through a review 2018 FracFocus water use data, consumptive water use required for hydraulic fracturing of the wells projected in the 2018 RFD is currently estimated at 11,615 AF, or about 580 AF in any given year. This projection, which is a slight decrease from the 2018 FracFocus water use/well average of 643 AF, would comprise about 0.12% of San Juan Basin 2015 total water withdrawals (486,660 AF). Development of the 2018 RFD would also require some water for drilling, dust control, and construction of reasonably foreseeable transmission lines and pipelines (BLM 2019a).

Beginning in 2015, the BLM FFO began receiving APDs that included new technologies that utilize greater quantities of water during the stimulation of the well under development, such as slick water stimulation. To date, 20 wells have been drilled using long laterals with slick water stimulation within the BLM FFO area. If the slick water trends discussed in Section 3.3.1.1 are realized and remain consistent over the 20-year RFD time frame, consumptive water use required for hydraulic fracturing of the wells projected in the 2018 RFD could be closer to 125,000 AF, or 6,250 AF in any given year. Annual water use would cumulatively represent about 1.3% of San Juan Basin 2015 total water withdrawals (486,660 AF). This projection represents a maximum reasonable estimate of future water use if existing slick water stimulation techniques (which currently comprise 3% of all well completions in the San Juan Basin) were to be applied to all 2,300 horizontal wells forecasted in the 2018 RFD over the next 20 years.

3.3.4.4 CUMULATIVE IMPACT ANALYSIS

Future water use for the other reported water use categories in the San Juan Basin is assumed to continue at current levels, and agricultural irrigation would continue to be the highest water use category in the San Juan Basin. See the Water Support Document (BLM 2019a) for more information about the 2018 RFD scenario and water use estimates. Water use associated with development of the Nageezi Unit 2309 and 2409 Cluster oil wells (103.04 AF) would comprise between 0.015% to 0.166% of the total estimated cumulative water use (depending on which cumulative water use scenario is considered) and between 0.31% and 3.3% of estimated cumulative water use in any given year (depending on which cumulative water use scenario is considered). Cumulative risks to groundwater quality from oil and gas development include potential contamination of freshwater aquifers from well integrity failures, spills, or loss of fluids during the drilling and completion processes associated with the 2018 RFD. The regulatory program discussed in the Water Support Document (BLM 2019a) and standard terms and conditions would greatly reduce cumulative risks to groundwater from the future well development.

3.3.5 Mitigation and Residual Impacts

Design features (detailed in Appendix H), which include limiting surface disturbance and conducting interim reclamation, would minimize the amount of water required for dust control. Design features to minimize the potential for spills that could impact water quality are also already included. As such, no additional mitigation is proposed. Residual impacts would be limited to the water use described in Section 3.3.3 (Environmental Impacts – Proposed Action), which could not be reduced without also adversely impacting air quality.

3.4 Issue 4: How would vehicle traffic and public road safety be impacted along the proposed haul truck route, which includes the community of Nageezi?

The analysis area for construction truck traffic along the proposed construction route extends from Bloomfield, New Mexico, to the proposed well pad cluster located in Nageezi, New Mexico. Construction truck traffic would utilize U.S. Highway 550 (U.S. 550) and County Road (CR) 7800 to transport materials to the proposed projects sites (see Map E.6 in Appendix E).

Data for the proposed transportation routes were obtained from the New Mexico Department of Transportation (NMDOT) (2018a) for the year 2018. The data include the annual average daily traffic (AADT), which is the total volume of traffic on a highway or road segment for 1 year, divided by the number of days in the year, and represents traffic on a typical day of the year (NMDOT 2012). Collision data for New Mexico were obtained through the NMDOT Records and Information Management Department (NMDOT 2018b).

Key assumptions used in the transportation analysis are as follows:

- DJR would mobilize construction trucks and crews in Bloomfield, New Mexico, travel south utilizing U.S 550 until reaching Nageezi, New Mexico. Construction crews and materials may come to Bloomfield from a variety of locations; however, those origination points are speculative and are therefore not included in the analysis.
- The Proposed Action would be accessed using CR 7800. NMDOT was unable to provide AADT data or accident data for CR 7800. Based on the existing conditions described in Section 3.4.1, the analysis assumes an average of eight heavy truck round trips per day in addition to local and visitor traffic.

- CR 7800 is the preferred construction route for construction equipment and construction activities. The total number of residences included in this analysis also includes 33 residences off CR 7820 that shares the same access point off U.S. 550 for approximately 0.4 miles. However, these residences and CR 7820 were not analyzed in in the traffic section due to proximity to U.S. 550.
- Approximately 3 to 4 months would be required to complete drilling and construction of each well pad and associated infrastructure. Pending DJR's construction schedule, construction may take place concurrently; however, if construction occurs sequentially, the Proposed Action would require a cumulative total of approximately 12 to 16 months to complete. Workers would be on-site between the hours of 6:00 a.m. and 6:30 p.m, 6 days per week (Monday–Saturday) for the duration of the Proposed Action.

3.4.1 Affected Environment

The primary construction truck route begins in Bloomfield, New Mexico, and travels south along U.S. 550 to Nageezi, New Mexico. From this point, the route changes direction and heads west on CR 7800, where it terminates at the proposed projects sites (See Figure E.6 in Appendix E). U.S. 550 is a major transportation artery that connects northern New Mexico to the Albuquerque metropolitan area. The town of Nageezi, New Mexico, is located in the heart of the San Juan Basin oil and gas fields where daily oil and gas operations utilizing U.S. 550 are commonplace. There are 16 active wells within 1.5 miles of the town on Nageezi. Residents of the area and visitors travel by personal vehicles along CR 7800 to access public and tribal land for scenic and recreational activities, including hunting, rock hounding, and photography.

Table 3.12 represents data for the proposed construction truck route, which include the New Mexico roads, the distance of each road, the 2018 AADT trend for each road, the 2018 crash data for each road, and the type of road. Per 2018 NMDOT traffic data, average daily traffic on the 36.8-mile route ranged between 2,025 to 13,316 vehicles, with a resulting 58 crashes reported for the year. NMDOT was unable to provide AADT data or accident data for CR 7800.

Table 3.12. Annual Average Daily Traffic and Crash Data for Proposed Route

Route	Distance (miles)	2018 AADT Trend	Number of Accidents	Type of Road
U.S. 550	36.0	13,316	58	four-lane paved state highway
San Juan CR 7800	0.8	N/A	N/A	two-lane paved roadway
Total	**36.8**	**13,316 average AADT**	**58**	-

N/A = Data is not available

NMDOT was unable to provide AADT statistics for CR 7800. This paved, two-lane roadway connects approximately 75 single family homes, the Nageezi Chapter House, a senior center, and a post office to U.S. 550. There is one existing oil and gas well and one existing central tank battery (CTB) that connects directly to CR 7800. This road hosts local residential traffic with an estimated 56 round trips per day. Road 7800 traffic typically comprises a mixture of residential traffic and oilfield traffic. The amount of residential traffic is not known, but there are 75 residences within 1.5-mile radius of the Proposed Action. Additionally, 16 wells are within a 1.5-mile radius, of which half are likely to use CR 7800. Based on operation numbers disclosed in Table 3.14, it is assumed there are about eight heavy truck round trips through the analysis area each day.

With consideration of the AADT data and the number of miles of each highway that would be driven as part of the construction truck and operational route, the average AADT for the proposed route is 13,316 vehicle trips. In addition to AADT data, NMDOT provided AADT truck data which totals 2,025 heavy truck trips per calendar year. The total amount of all vehicles utilizing US-550 totals to 15,341 per calendar year. According to the 2018 NMDOT traffic record, 2,025 vehicle trips (13%) are comprised of heavy truck traffic. Approximately 58 collisions were reported in 2018 in the affected area. Using the same percentages identified above, approximately 5 collisions were related to truck traffic. Table 3.13 represents AADT trends and accident data, as provided by NMDOT.

Table 3.13. 2018 AADT Trend, AADT Truck Trend and Associated Accidents for Proposed Route

Route	2018 AADT Trend	2018 AADT Truck Trend	Vehicles Accidents (Other Than Trucks)	Truck Accidents
U.S. 550	13,316	2,025	53	5
CR 7800	N/A	N/A	N/A	N/A
Total	**13,316**	**2,025**	**53**	**5**

N/A – Data is not available

3.4.2 Environmental Impacts - No Action Alternative

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. There would be no increased construction or operational truck traffic within the U.S. 550, CR 7800, and Nageezi community.

3.4.3 Environmental Impacts - Proposed Action

3.4.3.1 DIRECT AND INDIRECT IMPACTS

If the Proposed Action is approved, construction trucks and operational personnel would utilize the U.S. 550 and CR 7800 corridor and begin construction. Construction of each proposed project would take approximately 3 to 4 months per well pad and associated infrastructure which includes well drilling and completion activities and may take place concurrently. However, construction could take a cumulative total of 12-16 months to complete the Proposed Action if completed sequentially. Approximately ten to fifteen standard oilfield pickup trucks will be used to transport construction personnel to the construction site each day. Approximately six to eight transport truck loads are expected to deliver equipment to the proposed project areas. Heavy equipment will be transported and left on-site until construction is complete. Workers will be on-site approximately 10 hours per day, 6 days per week (Monday–Saturday) for the duration of the Proposed Action. The workers would commute to the construction area early in the morning at 6:00 a.m. and will return in the evening at 6:30 p.m.

Table 3.14 represents the estimated duration of each construction component, total vehicle round trips, and average vehicle round trips per day.

Table 3.14. Total Average Daily Round Trips for All Construction Vehicles Per Proposed Project Area

Project Construction Phase	Duration (Days)	Total Number of Round Trips (Heavy Vehicles)	Total Number of Round Trips (Light Vehicles)	Average Daily Round Trips (Heavy Vehicles)	Average Daily Round Trips (Light Vehicles)	Total Average Daily Round Trips (All Vehicles)
Construction	12	4	24	0.25	2.00	2
Drilling	12	203	151	16.92	12.58	30
Completions	10	97	171	9.70	17.10	27
Flow testing	15	407	82	27.13	5.47	33
Pipeline connect	12	24	156	2.00	13.00	15
Reclamation	30	41	216	N/A	N/A	9

Source: Construction duration and total number of round trips provided by DJR (DJR 2020c).

Heavy vehicles are considered greater than 26,001 pounds of gross vehicle weight. Light vehicles are less than 19,501 pounds of gross vehicle weight.

N/A – Data is not available.

The daily average round trips during the construction phase would range between two and 33 vehicles utilizing the U.S. 550 and CR 7800 corridor until the Proposed Action is completed.

Once the four well pads and pipeline are constructed in the span of up to 16 months if construction occurs sequentially, standard operational tasks and maintenance would begin. The construction of each new well pad would require more daily maintenance. As time progresses, each well pad would require less and less attention. Standard oilfield pickup trucks would visit each well pad. Table 3.15 represents the daily well pad visit for maintenance activities after well pad construction.

Table 3.15. Average Daily Well Pad Visits by DJR Operational Staff

Month	Total Vehicle Visits per 30 Days	Daily Vehicle Visit
First month	73	2.4
Second month	63	2.1
Third month	48	1.6
Fourth month	39	1.3
Fifth month	34	1.1
Sixth month	30	1.0

During the first month, an average of 2.4 pickup trucks per day would visit each well on each pad. By the sixth month of operation, the number of vehicles visiting each well pad would be reduced by half, with 1.0 pickup truck visiting each well on each well pad once per day. The number of maintenance visits would be even further reduced after Year 3 of operation. It is expected that a DJR operator would have to visit each well once per month for the lifespan of the Proposed Action.

CR 7800 is the main thoroughfare for the Nageezi community, connecting rural residences to U.S. 550. Along CR 7800 resides a chapter house, senior center, post office, and multiple residences. This road has a wide demographic and age span from school-aged children to elderly community members. It is estimated that 20 residential round trips on average are completed each day. Construction truck traffic would effectively double for the construction of the Proposed Action for a temporary duration of either 3

to 4 months if construction occurs concurrently or 12 to 16 months if construction activities occur sequentially.

Given the amount of traffic that U.S. 550 hosts per day, the Proposed Action would have a negligible increase in construction and operational vehicle traffic in addition to negligible increase in traffic collisions per year.

3.4.4 Cumulative Impacts

3.4.4.1 CUMULATIVE IMPACT AREA

The analysis area established to determine cumulative impacts on vehicle traffic and public road safety are the geographical boundaries extending from Bloomfield, New Mexico, traveling south along the U.S. 550 corridor and terminating at the Navajo Nation Nageezi Chapter along CR 7800.

3.4.4.2 PAST AND PRESENT ACTIONS

There is very little development beyond oil and gas and residential homes within the geographic boundaries of the town of Nageezi. Oil and gas development include both wells and associated well pad with standard infrastructure and linear pipeline and access road development

3.4.4.3 REASONABLY FORESEEABLE FUTURE ACTIONS

DJR is the lease holder for all lease parcels within the Nageezi unit. Therefore, reasonably foreseeable future actions within the town of Nageezi would include future DJR oil and gas–related projects including the construction of the approved DJR NU CLF and the proposed development of DJR's Nageezi gathering system infrastructure which includes approximately 12 miles of pipeline that would result in a reduction of product transportation, which would be a long-term beneficial impact due to the reduction of traffic impacts.

3.4.4.4 CUMULATIVE IMPACT ANALYSIS

The expansion of DJR's infrastructure would require more construction personnel and equipment accessing roads throughout the area. As with the Proposed Action, construction equipment and crews associated with reasonably foreseeable future actions are expected to assemble in Bloomfield, New Mexico, and travel approximately 36 miles to Nageezi, New Mexico, using U.S. 550. The impact from these actions would have a negligible increase in vehicle traffic and possible vehicle collisions for U.S. 550; however, CR 7800 would see a substantial increase in vehicle traffic during the construction of reasonably foreseeable wells (including the Proposed Action). It is estimated that eight heavy truck round trips are expected to utilize the U.S. 550 and CR 7800 corridor per day. Once construction is complete, each new well would require two trips daily for the first 6 months and one trip daily thereafter. Development of the proposed NU CLF to Marathon Tie-in pipeline would provide countervailing impacts to transportation, decreasing oil and gas–related truck traffic within the Nageezi community.

3.4.5 Mitigation and Residual Impacts

Design features (detailed in Appendix H), which include posting signage and instructing construction personnel on safe driving practices, would minimize the impact to potential vehicle accidents due to increased traffic, thus reducing the construction impact to the Nageezi community.

3.5 Issue 5: How would noise generated during construction activities, including well drilling/completion, pipeline

installation, and access road construction, from heavy equipment affect nearby residences?

Noise from construction activities, including well drilling/completion, pipeline installation, and access road construction may affect residences west of the Nageezi post office by increasing background (ambient) noise levels. The primary impact-causing elements, as the main sources of noise, would be equipment associated with well drilling/completion, pipeline installation, and access road construction. This equipment includes one or more of the following: chainsaw, brush hog, scraper, maintainer (service truck), excavator, dozer, backhoe, hydrovac, welder, trencher, side-boom tractor, and specialty equipment. Noise impacts are assessed by comparing estimated levels of noise perceived at sensitive noise receptors with reference sound levels (Table 3.16).

The analysis area for noise impacts is defined as a 1.5-mile radius surrounding the proposed project area. To assess noise from the project, five representative groups of sensitive noise receptors have been identified in the vicinity of the project area (see maps in Appendix E). These groups, which include clusters of residences west of the Nageezi post office (comprising 52 residences in total) have been selected to capture perceptible noise impacts to residences and other occupied buildings closest to proposed project activities. The selection process for sensitive noise receptors excluded receptors where project-related noise levels would be attenuated to background levels. The analysis examines both short-term (construction) and long-term impacts (operation) of the Proposed Action. The lifespan of the proposed wells is expected to last 20 years.

The analysis is based on the following assumptions:

- Rate of noise attenuation follows the inverse square law: the intensity changes in inverse proportion to the square of the distance from the source. This is roughly 6 decibels (dB) of attenuation as the distance doubles, starting at 50 feet from the source (e.g., at 100 feet from source, the noise level is reduced by 6 dB; at 200 feet from source, the reduction is 12 dB).
- Other factors that may affect how noise is perceived by the human ear, such as ambient air pressure, temperature, wind, humidity, general weather conditions, and terrain occlusion, were not considered in the noise attenuation analysis for the Proposed Action.

3.5.1 Affected Environment

The Federal Noise Control Act of 1972 and subsequent amendments (42 USC 4901 et seq.) establishes a requirement that all federal agencies must administer their programs in a manner that promotes an environment free from noise that jeopardizes public health or welfare. The Act also directs all federal agencies to comply with federal, state, interstate, and local noise control and abatement requirements. In order to establish federal noise emission control requirements in response to the Federal Noise Control Act of 1972 and to ensure assistance and guidance to states and localities, the EPA has published guidelines with exterior noise level goal of less than 55 A-weighted decibels (dBA) in areas of residential land use (EPA 1974).

3.5.1.1 NOISE AND SOUND MEASUREMENTS

Noise is generally defined as a sound, typically unpleasant or undesirable, that causes disturbance and interruptions to normal activities. To understand and adequately assess impacts to ambient noise conditions associated with the proposed projects, the human perception of sound must be demonstrated and understood. Sound levels are measured on a logarithmic scale in decibels (dB). Because decibels are a logarithmic number, mathematical operations such as addition require special consideration. For example, to add two or more noise levels, if the difference between the highest and next highest noise level is:

- 0 to 1 dB, add 3 dB to the higher level to give the total noise level
- 2 to 3 dB, add 2 dB to the higher level to give the total noise level
- 4 to 9 dB, add 1 dB to the higher level to give the total noise level
- 10 dB or larger, then the noise level is unchanged (i.e. the higher level is the total level)

The quietest audible sound is defined as 0 dB (the auditory threshold), while the threshold of pain (from a very loud sound) is upwards of 140 dB. Decibel levels can be weighted, or adjusted, to approximate human perception of sound which varies with frequency (hertz). The most common weighting system is "A"-weighting, represented as dBA. A change in noise level of at least 5 dBA is required before any noticeable difference can be detected by the human ear. A 10-dBA increase in sound level is perceived as "twice as loud," while a 10 dBA decrease in sound level is perceived as "half as loud" by the average individual (EPA 1974). The time spent near the noise source (acclimatization) and the distance to the source are also factors in human perception of noise.

Changes in ambient noise conditions can be determined from the introduction of a sound (measured in dBA) and the duration of the sound, as heard from a specific location. Table 3.16 references examples of sound sources and typical sound levels.

Table 3.16. Example of Sound Sources and Typical Sound Levels

Descriptions of Sound Source	Sound Level (dBA)
Threshold of pain Airplane taking off	140
Chainsaw Ambulance siren	120
Car horn Rotary saw Leaf blower	110
Gas lawn mower	100
Garbage disposal Large truck	90
Noisy urban area during the day Doorbell	80
Freeway traffic Vacuum cleaner	70
Normal speech	67
Clothes dryer Washing machine	60
Refrigerator Background noise in a busy office Wooded suburban residential area (Ldn)	50
Urban nighttime Rural residential area (Ldn)	40
Quiet bedroom at night	30
Threshold of hearing	0

Note: Ldn is a measure of outdoor day/night sound levels, averaged over a 24-hour period

Source: Adapted from Center for Hearing and Communication (2020) and EPA (1978)

In general, the louder the sound, the less exposure time is required before hearing damage may occur. Long-term, continuous exposure to noise above 85 dBA will cause hearing loss (Center for Hearing and Communication 2020).

Existing Noise Characteristics of the Area

The greatest noise source within the analysis area occurs from existing oil and gas operations. A nearby four-lane road, U.S 550, also contributes noise to the analysis area. Typical oil and gas activity noise was reported from a study in La Plata County, Colorado (Table 3.17).

Table 3.17. Example of Sound Sources and Typical Sound Levels from Oil and Gas Activities

Descriptions of Sound Source	Sound Level (dBA) at 500 Feet from Source
Well completion rig	75
Typical construction site	65
Drilling rig	59 (dB; unweighted)
Heavy equipment (when operating)	68
Compressor station	69
Pumpjack	62
Compressor station with soundwall	46

Source: Adapted from Common Ground Community Trust (2017), BLM (2000), and DJR (2020c).

To assess baseline noise levels, it was determined there are approximately eight oil and natural gas well pads (U.S. Department of Homeland Security 2019) within a 1.5-mile radius of the Proposed Action. For the analysis, it is assumed each well pad has noise-producing equipment.

The baseline noise level assessment area also contains 74 residential lots (New Mexico Department of Information Technology 2020), of which approximately 52 are within the sensitive noise receptor analysis areas (see below). The ambient noise level within the analysis area has not been measured; however, the outdoor 24-hour average sound level (Ldn) in rural residential areas is approximately 40 dBA (EPA 1978).

For the purposes of this analysis, a value of 40-dBA Ldn is assumed for all residential areas, including the sensitive noise receptors, based on the proximity of the residences to existing noise sources such as oil and gas wells and public roads. This is based on the predicted attenuation for existing oil and gas production–related sound sources (compressor stations and pumpjacks; see Table 3.17) based on distance between existing noise sources and residential areas, which is greater than 500 feet.

Ambient noise levels in the vicinity are likely higher than 40 dBA near existing oil and gas production sites, existing oil and gas roads in the area, and U.S. 550, and are expected to be closer to 40 dBA elsewhere in the vicinity due to limited human activity on the largely undeveloped land surrounding the analysis area.

Sensitive Noise Receptor Groups

Five sensitive noise receptor groups in close proximity to pads NU B02, NU G35 and NU M35 (pad NU H33 is not in close proximity to any residences) have been chosen for analysis to gauge the estimated levels of noise generated from the construction and operation of the proposed projects at gradual distances from the noise source:

1. Cluster of approximately eight residences approximately 1,100 feet west of the Nageezi post office (Map E.7 in Appendix E). This receptor is approximately 1,360 feet east of the nearest project component, the NU B02 G-tank pad, and 1,700 feet east of the nearest well pad, NU B02.
2. Cluster of approximately 33 residences approximately 1,300 feet southwest of the Nageezi post office (Map E.7 in Appendix E). This receptor is approximately 1,500 feet southeast of the nearest project component, the NU B02 G-tank pad, and 1,870 feet east of the nearest well pad, NU B02.
3. Cluster of approximately seven residences along CR 7800 (Map E.7 in Appendix E). This receptor is approximately 700 feet west of the nearest project component, the pipeline trench close to the NU M35 G-tank pad, and 2,200 feet west of the nearest well pad, NU M35.
4. Cluster of approximately two residences approximately 900 feet north of CR 7800 (Map E.7 in Appendix E). This receptor is approximately 850 feet north of the nearest project component (the pipeline trench) and 2,400 feet west of the nearest well pad, NU G35.
5. Cluster of approximately two residences along CR 7800 (Map E.7 in Appendix E). This receptor is approximately 940 feet north of the nearest project component (access road to the NU G35 pad) and 1,100 feet west of the nearest well pad, NU G35.

3.5.2 Environmental Impacts - No Action Alternative

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. Existing background noise levels from existing sources (oil and gas wells, road traffic, etc.) would continue.

3.5.3 Environmental Impacts - Proposed Action

Additional residences, beyond those captured in the sensitive noise receptors, are present in the vicinity; however, these additional residences are more distant from the proposed project activities and would experience de minimis impacts even lower than those analyzed for the sensitive noise receptors.

3.5.3.1 CONSTRUCTION

During construction of the access roads, well pads, and pipelines, it is estimated that 20 to 30 construction personnel would be on-site 6 days per week (Monday–Saturday) between the hours of 6:00 a.m. and 6:30 p.m.; they would be transported to and from the site by 10 to 15 standard-size pickup trucks. Construction personnel would be on-site 24 hours per day/7 days per week during the well drilling and completion phase for each proposed project. This equipment includes one or more of the following: chainsaw, brush hog, scraper, maintainer (service truck), excavator, dozer, backhoe, hydrovac, welder, trencher, side-boom tractor, and specialty equipment. As shown in Table 3.18, the typical construction site generates approximately 65 dBA of noise 500 feet from the site, with excursions to approximately 68 dBA at 500 feet when heavy equipment is operating.

Based on the noise attenuation assumptions above, the typical noise levels emanating from construction of the proposed projects are captured in Table 3.18, which shows that the noise attenuates nearly to background levels approximately 7,920 feet (1.5 miles) from the source.

Table 3.18. Summary of Predicted Noise from Construction Activities by Distance

Approximate Distance in Feet (Miles) from Construction Activity	Approximate Noise Level (dBA) Emanating from Construction
500 (0.09)	65
700 (0.13)	62
900 (0.17)	60
2,400 (0.45)	51
7,920 (1.50)	41

Based on the noise levels represented in the table above, typical noise emanating from the proposed construction activities would drop to approximately 62 dBA at the nearest sensitive noise receptor group (#3, approximately seven residences), which is 700 feet from the proposed pipeline construction along CR 7800. If this were added to the existing ambient noise level (40 dBA Ldn), the combined noise level experienced at receptor #3 would be 62 dBA Ldn, which is slightly louder than a washing machine or clothes dryer. This assumes 24-hour operation of construction equipment; however, it is anticipated some equipment would operate only 12 hours per day, which may reduce nighttime noise impacts even further. Receptor #3 could experience excursions of up to 65 dBA when heavy equipment is operating.

The other sensitive noise receptor groups (#1, #2, #4, #5) would experience lesser impacts due to their greater distance from the proposed noise sources. Receptors #4 and #5 (approximately 900 feet away) would experience a typical total noise level of approximately 60 dBA, which about as loud as a washing machine or clothes dryer (see Table 3.16). The receptors furthest from the proposed project, receptor groups #1 and #2 (approximately 40 residences), would experience a typical total noise level of approximately 55 dBA, slightly louder than a refrigerator (see Table 3.16). Existing noise sources include 8 oil and gas production sites and several gravel and two- and four-lane paved roads within a 1.5-mile radius of the proposed project area.

Construction associated with the proposed projects would be sequential, focusing on each of the various project areas one after another. Pipeline construction would likely be completed in less time than well pad construction activities, reducing the duration of impacts to sensitive noise receptors near the proposed pipeline but distant from proposed well pads (as in the case of receptor groups #3 and #4, which are 700 and 840 feet, respectively, from the proposed pipeline trench).

The receptors would also experience noise emanating from well completion activities (Table 3.19).

Table 3.19. Summary of Predicted Noise from Well Completion Activities by Distance

Approximate Distance in Feet (Miles) from Well Completion Activity	Approximate Noise Level (dBA) Emanating from Well Completion
500 (0.09)	75
1,100 (0.21)	68
1,700 (0.32)	64
2,400 (0.45)	61
7,920 (1.50)	51

In general, the sensitive noise receptor groups are further away from proposed well completion activities than from general construction activities (which are anticipated to generate less noise than well completion activities). The nearest receptor group (#5) is 1,100 feet distant from the nearest well pad, NU G35. This receptor would experience peak total noise levels of approximately 68 dBA when well completion activities are in progress, which is slightly louder than a typical human conversation. The other sensitive noise receptors (#1–#4) would experience lesser impacts from well completion due to their greater distance from the proposed noise sources. For example, receptors #1 and #2 would experience peak total noise levels of approximately 64 dBA when well completion activities are in progress, which is quieter than a typical human conversation. Well completion activities are anticipated to generate noise for less time (1–2 weeks per well) than general construction activities, which would last up to 4 months per project area.

3.5.3.2 OPERATION

After construction of the proposed projects, the well pads would contain noise-producing permanent equipment such as compressors. The noise-producing equipment on each well pad would be in operation 24 hours per day. The compressors anticipated to be installed on the well pads nearest the receptor groups (pads NU B02 and NU G35, which are nearest receptor groups #1, #2, #4, and #5) would be fenced with a soundwall (a sound-deadening structure) that lowers the emitted sound to approximately 58 dBA at 120 feet (DJR 2020c). Sound-deadening structures are not proposed for the NU M35 pad because the NU M35 pad is over 2,300 feet from the nearest receptor group and is surrounded by hills, which would act as a natural sound barrier. Sound-deadening structures are also not proposed for the NU H33 pad because it is over 4,000 feet from the nearest receptor group.

The noise levels emanating from operation of the proposed projects are captured in Table 3.20.

Table 3.20. Summary of Predicted Noise from NU B02 and NU G35 Operations Activities by Distance

Approximate Distance in Feet (Miles) from Compressor Station with Soundwall	Approximate Noise Level (dBA) Emanating from Operation
120 (0.02)	58
240 (0.04)	52
480 (0.09)	46
960 (0.18)	40
1,100 (0.21)	39
1,700 (0.32)	35

Based on the noise levels represented in the above table, noise emanating from the proposed NU B02 and NU G35 operations activities would drop to 39 dBA at the sensitive noise receptor nearest the proposed well pads, receptor group #5, which is approximately 1,100 feet west of the NU G35 well pad. If this noise were added to the existing ambient noise level (40 dBA Ldn), the combined noise level experienced at receptor #5 would be 43 dBA Ldn, which is quieter than a refrigerator. Sensitive receptors closest to NU B02 (receptor group #1, 1,700 feet away from NU B02) would experience an approximately 1-dBA increase over ambient noise levels. As described in Section 3.5.1, an increase of less than 5 dBA over existing conditions would be almost imperceptible.

The other sensitive noise receptors (#2, #3, #4) would experience lesser impacts due to their greater distance from the proposed noise sources. These receptors would remain close to the existing ambient noise level of 40 dBA Ldn.

3.5.4 Cumulative Impacts

3.5.4.1 CUMULATIVE IMPACT AREA

The analysis area established to cumulative impacts from noise is a circular area approximately 1.5 miles in radius from the Proposed Action center. Beyond this distance, all noise from the proposed projects (short-term and long-term) would attenuate to 51 dBA, which is just above the noise level of a refrigerator or the background noise level present in a wooded suburban residential area.

3.5.4.2 PAST AND PRESENT ACTIONS

There is very little development beyond oil and gas and residential homes within the geographic boundaries of the town of Nageezi. Background noise levels are also affected by close proximity to eight oil and gas production sites and roads, including several gravel and two- and four-lane paved roads within a 1.5-mile radius of the proposed project areas.

3.5.4.3 REASONABLY FORESEEABLE FUTURE ACTIONS

DJR is the lease holder for all lease parcels within the Nageezi unit. Therefore, reasonably foreseeable future actions within the town of Nageezi would include future DJR oil and gas–related projects including the construction of the approved DJR NU CLF and the proposed development of DJR's Nageezi gathering system infrastructure which includes approximately 12 miles of pipeline that would result in a reduction of product transportation, which would be a long-term beneficial impact due to the reduction of traffic noise.

Future drilling rigs and associated construction equipment would have a temporary impact on local background noise levels, while production facilities, access roads, pipeline rights-of-way (ROWs) and well pads would have a long-term impact on background noise levels quality. Additional residential communities may be established within the Nageezi community, or existing communities may be expanded.

3.5.4.4 CUMULATIVE IMPACT ANALYSIS

Existing noise sources include eight oil and gas production sites and several gravel and two- and four-lane paved roads within a 1.5-mile radius of the proposed project areas. Background noise levels could increase as other projects are developed in the area. The Proposed Action would increase noise disturbance to the surrounding area, particularly in the short term, although long-term impacts to the background noise level (from 40 dBA to 43 dBA) would scarcely be perceptible, creating an incremental but cumulative impact in conjunction with the past, present, and reasonably foreseeable future actions.

3.5.5 Mitigation Measures and Residual Impacts

DJR would minimize impacts to noise disturbance by maintaining construction and operations equipment and vehicles in proper operating condition. These devices would also be equipped with manufacturers' standard noise control devices or better (e.g., mufflers, engine enclosures). As such, no additional mitigation is proposed. Residual impacts would be limited to the noise impacts described in Section 3.5.2 (Environmental Impacts – Proposed Action).

3.6 Issue 6: How would construction and operation of the facilities associated with the Proposed Action, primarily the NU B02 and NU M35 project area, impact the scenic quality for the Nageezi community?

The primary impact-causing element is the construction of the NU B02 and NU M35 well pads. Operations elements include the introduction of portable and permeant structures, heavy equipment, and vehicles into the viewshed of the area. The analysis area for visual resources is the combined viewsheds from three key observation points (KOPs), which are located east and west of the project areas. These KOPs (Map E.8 in Appendix E) were selected based on proximity to residences within the Nageezi community and reflect visually sensitive views of the analysis area. The visual analysis indicator is the degree of contrast in line, form, color, and texture from the introduction of the new components as viewed from the KOPs at 1 year into project operations.

3.6.1 Affected Environment

Visual resources include the natural and human-modified landscape. The existing visual quality of the proposed project areas is influenced by open BLM land, Navajo Nation, oil and gas operations, rural residential communities, and undisturbed landscape surrounding the proposed project areas.

The proposed project areas are in a foreground to middle ground zone, a classification by the BLM that defines the project areas as visible for 5 to 10 miles. Within this distance, the most visible features, aside from the mountains, are existing small-to-medium residences, paved and unpaved roads, existing oil and gas infrastructure. Predominant colors include tans and browns from the sandy soils and gray tones from exposed minerals; light to medium greens and yellows from the vegetation; adobe, grey, and cream colors from the homes and human-made structures; and the occasional red or yellow from signs or vehicles.

The casual observers in this area are residents living in the Nageezi community neighborhoods, as well as any visitors using CR 7800. Visitors travel by personal vehicles along CR 7800 to access public and tribal land for scenic and recreational activities, including hunting, rock hounding, and photography. This range of individuals defines the casual observer.

3.6.1.1 VISUAL RESOURCE MANAGEMENT CLASSES AND OBJECTIVES

The BLM is responsible for managing public land for multiple uses while ensuring that the scenic values of public land are considered before authorizing actions on public land. The BLM accomplishes this through the Visual Resource Management (VRM) system. BLM-administered land is categorized into one of four VRM classes, as described in BLM Manual H-8410 (BLM 1986), and is managed in accordance with the class objectives. The project is within a VRM Class IV area, as described in the Farmington RMP (BLM 2003a). The objective of this class is to provide for management activities that require major modifications for the existing character of the landscape. The level of change may be high and may dominate the view and be the major focus of viewer attention.

3.6.2 Environmental Impacts - No Action Alternative

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. Existing conditions consistent with VRM Class IV objectives continue.

3.6.3 Environmental Impacts - Proposed Action

The BLM's VRM program (BLM 1986) includes a standardized system for reviewing land actions for RMP conformance. The analysis area for visual impacts are the viewsheds from three KOPs identified based on the aerial imagery of the surrounding public's general view of the proposed project areas. The primary visual issue was impact to residents' views of the public land from their residences.

Three KOPs were chosen to represent views from private residences in the area around the proposed NU B02 and NU M35 well pads (see Figures D.24–D.26 in Appendix D). Visual contrast rating worksheets for each KOP are provided in Appendix K. For the three KOPs closest to the proposed well pads, one time frame is analyzed: at the 1-year operational interval. The single time frame represents the viewshed impacts through the life of the proposed projects. Associated scenic quality impacts to the quality of life for Nageezi residents are discussed in section in Section 3.7.

Each proposed project would have a variety of temporary and permanent equipment within its construction zone. Compressor engines, G-tanks, vapor recovery towers, and comingled liquid storage tanks are expected to be constructed.

Table 3.21 provides an impact summary from introduced contrasts at each KOP. KOPs from the Nageezi residential community off of CR 7800, the Nageezi residential community off of CR 7820, and private residences south of CR 7800 illustrate views for community residents and recreationists who would see the proposed well pads while using the area (see Map E.8 in Appendix E). These KOPs illustrate the proposed well pad, in particular, the NU B02 and the NU M35 well pad, at the foreground/middle ground. The visual contrast rating worksheets for each KOP are in Appendix K.

Table 3.21. Summary of Impacts to KOP Viewsheds

KOP	Time Frame	Feature -Element	Degree of Contrast	Conformance to VRM Class IV Objectives
Residential community off CR 7800 (KOP 1, proximal to seven residences)	1-year	Land - form, line, color, texture	Weak	Yes
		Vegetation - form, line, color, texture	Weak	
		Structures - form, line, color, texture	Moderate	
Residential community off CR 7820 (KOP 2, proximal to 33 residences)	1-year	Land - form, line, color, texture	None	Yes
		Vegetation - form, line, color, texture	None	
		Structures - form, line, color, texture	None	
Residential community south of CR 7800 (KOP 3, proximal to 13 residences)	1-year	Land - form, line, color, texture	Weak	Yes
		Vegetation - form, line, color, texture	Weak	
		Structures - form, line, color, texture	Weak	

KOP 1: The overall short-term contrasts created by the proposed well pad, and in particular, the NU B02 well pad would range from weak to moderate (see Appendix K for the visual contrast rating worksheet). From this KOP, the construction of the well pad would be noticeable and distinct. Introduction of temporary structures, such as G-tanks would create weak contrasts; however, vegetation removal would

not be fully reclaimed until 2 years later. The well pad would consist of six 400-bbl comingled liquids tanks and would create the largest contrast in scenic quality. Given the distance from the proposed NU B02 to the residential community off CR 7800 (0.32 mile), the proposed NU B02 project would meet VRM Class IV objectives while in operation.

KOP 2: The overall short-term contrasts created by the proposed well pad would be none (see Appendix K for the visual contrast rating worksheet). From this KOP, the proposed NU B02 well pad construction would not be visible. The elevation difference and distance would render the NU B02 construction site invisible from the residential community off CR 7820. Given the distance from the residential community (0.27 mile) and the topographic relief, the proposed NU B02 project would meet VRM Class IV objectives while in operation.

KOP 3: The overall short-term contrasts created by the proposed NU M35 well pad would be weak (see Appendix K for the visual contrast rating worksheet). The greatest contrasts would be from ground disturbance, active well pad construction, and vegetation removal in the viewshed for the proposed NU M35 well pad. Introduction of temporary structures, such as G-tanks, would create weak, temporary contrasts; however, vegetation removal would not be fully reclaimed until 2 years later. The temporary G-tank will parallel CR 7800 and remain in place for a total of approximately 10 weeks; it is estimated that one well would take 1 to 2 weeks to complete and the NU M35 well pad is proposing to drill 5 wells. After completion of the NU M35 wells, G-tanks would be removed. The land color during well pad construction, a light tan, contrasts minimally with the surrounding foothills. Given the proximity of the KOP to the well pad (0.51 mile), the proposed NU M35 well pad would attract minimal attention and not dominate the viewshed during operations. VRM Class IV objectives would be met.

Compared to the rest of the KOP locations, KOP 1 would have the most impact to scenic quality for the Nageezi community, in particular the short-term contrasts of the NU B02 well pad. However, the long-term impacts viewed from this KOP would be weak because the NU B02 pad reclamation would include revegetation and topsoil replacement mimicking undisturbed landscape features. Following successful camouflaging of tank infrastructure located on the NU B02 pad, all contrasts would remain weak. The Proposed Action would meet VRM Class IV objectives.

3.6.4 Cumulative Impacts

3.6.4.1 CUMULATIVE IMPACT AREA

The analysis area established to cumulative impacts on scenic quality are the geographical boundaries of the Navajo Nation Nageezi Chapter, where the impacts to scenic quality for the Nageezi community is likely to occur because of potential oil and gas development in the BLM FFO area.

3.6.4.2 PAST AND PRESENT ACTIONS

There is very little development beyond oil and gas and residential homes within the geographic boundaries of the town of Nageezi. Oil and gas development include both wells and associated well pad with standard infrastructure and linear pipeline and access road development

3.6.4.3 REASONABLY FORESEEABLE FUTURE ACTIONS

DJR is the lease holder for all lease parcels within the Nageezi unit. Therefore, reasonably foreseeable future actions within the town of Nageezi would include future DJR oil and gas–related projects including the construction of the approved DJR NU CLF and the proposed development of DJR's Nageezi gathering system infrastructure which includes approximately 12 miles of pipeline that would result in a

reduction of product transportation, which would be a long-term beneficial impact due to the reduction of visual impacts.

3.6.4.4 CUMULATIVE IMPACT ANALYSIS

The scenic quality of the area could potentially degrade as reasonably foreseeable oil and gas infrastructure develops within the area. Short-term disturbances, such as drilling rigs, G-tanks and associated construction equipment would have a temporary impact on scenic quality, while access roads, pipeline ROWs, and well pads would have a long-term impact on scenic quality. The Proposed Action would add new form, line, color, and texture elements to the landscape, creating an incremental addition to the past and present actions near the community of Nageezi. In particular, the proposed NU B02 well pad would have a moderate contrast to scenic quality of Nageezi residences due to its close proximity to six 400-bbl co-mingled liquid storage tanks.

3.6.5 Mitigation and Residual Impacts

Design features (detailed in Appendix H), which include camouflaging all well pads and production equipment and would minimize the impact to the viewshed and scenic quality. As approved by the BLM, all proposed well pad infrastructure would be painted covert green to help mask the infrastructure from the casual observer. As such, no additional mitigation is proposed. Residual impacts would be limited to the visual impacts described in Section 3.6.2 (Environmental Impacts – Proposed Action).

3.7 Issue 7: How would development of the Proposed Action impact the quality of life of nearby residents, including the community of Nageezi?

Quality of life impacts are generalized concerns voiced by potentially impacted communities and are not specifically defined in law, regulation, or Executive Order. The BLM has determined that there is the potential for localized air, visual resources, traffic and safety, and noise impacts that could affect quality of life, particularly during construction, for all residents and users in the area of analysis. Continued expansion of the oil and gas industry as a whole may also be perceived as having a negative effect on quality of life for people who value undeveloped landscapes and lack of artificial structures, including infrastructure such as pumpjacks, roads, and cleared pipeline ROWs.

The analysis area is the census-designated geographic boundaries of the town of Nageezi. This analysis area was chosen because the town of Nageezi contains the community that would be the most impacted by the Proposed Action. For this analysis, "quality of life" is defined as "a feeling of well-being, fulfillment, or satisfaction resulting from factors in the external environment" (Greenwood 2001). The quality of life definition was chosen for the focus on external environmental factors and due to a lack of data on existing quality of life issues for the analysis area.

3.7.1 Affected Environment

The Proposed Action is located within the town of Nageezi, New Mexico, with a population of approximately 261 residents (Census Reporter 2018). Approximately 0.25 mile east of the proposed NU B02 project are two residential neighborhoods with a total of 41 residences. San Juan County Road 7820 and 7800, and U.S. 550 are the main access roads to the residences. There is a low level of existing oil and gas development within and surrounding the town of Nageezi, which may contribute to existing quality of life impacts for air quality, visual resources, traffic and safety, and noise impacts.

3.7.2 Environmental Impacts- No Action Alternative

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. No resulting impacts to quality of life from air emissions, groundwater quality and quantity, traffic safety, noise, and scenic quality would occur.

3.7.3 Environmental Impacts- Proposed Action

Quality of life issues are generally subjective, and the intensity and importance of the impacts from the Proposed Action would likely vary from individual to individual, as well as from community to community. Therefore, quality of life issues are kept at a general level, both in terms of quality of life values and potential impacts. Potential impacts to the quality of life are included in Table 3.22. below.

Table 3.22. Potential Impact of the Proposed Action to Quality of Life Values

Quality of Life Value	Potential Impact to Quality of Life
Air Emissions	Localized temporary impacts from construction, particularly dust, lasting an average of 3 to 4 months per proposed project. Quality of life may be temporarily affected by presence of increased dust or other emissions during construction dependent on the proximity of residences to future potential development as well as atmospheric conditions such as wind speed and direction. Emissions would be minimized through application of air resource protection design features (see Appendix H - Design Features). As such, construction associated with the Proposed Action is unlikely to contribute to a violation of air quality regulations. In addition, the Proposed Action would result in annual increased criteria pollutant emissions from the exhaust emissions from equipment, compressor engines, generators, and flares; and VOCs resulting from oil storage activities (see Table 3.4 in Section 3.1.3). The emissions from the operation of well pads and wells would result in a 0.099% increase in NO_x, 0.001% increase in SO_2, 0.075% increase in CO, 0.312% increase in VOCs, 0.003% increase in PM_{10}, and 0.016% increase in $PM_{2.5}$. The majority of operational emissions associated with the proposed project would be minimized through design features provided in Appendix H.
Groundwater Quantity and Quality	Total potential groundwater use would comprise less than 0.005% of the 2015 San Juan Basin total water use and 0.039% of 2015 San Juan Basin total groundwater use. Drilling fluids would be recycled and transferred to other permitted closed-loop systems or returned to the vendor for reuse until DJR's gathering systems are in place and eventually will be transported via pipeline to the liquids facilities. Residual and flowback water would be recycled or disposed of at a waste disposal facility Any spills of non-freshwater fluids would be immediately cleaned up and removed to an approved disposal site. DJR will also notify the BLM within 24 hours of any reportable spill. Should a spill occur, the BLM would work with the NMOCD to immediately remediate spills on BLM land in accordance with federal and state standards, including 19.15.29.11 NMAC. (see Section 3.3.3). See also the associated SUPOs on file with the BLM FFO for more information regarding DJR's closed loop systems. There have not been any documented past instances of groundwater contamination in the analysis area attributed to well drilling (BLM 2019a). Due to DJR's adherence to the NMOCD's casing, cementing, and pressure-testing requirements to prevent contamination of aquifers, it is anticipated that the proposed wells would not impact water quality. Should a spill occur, the BLM would work with the NMOCD to immediately remediate spills on BLM land in accordance with federal and state standards, including NMAC 19.15.29.11.
Traffic Safety	The Proposed Action would result in an increase of truck traffic on the U.S. 550 corridor and San Juan CR 7800. During construction, there would be approximately two to 33 roundtrips for heavy and light vehicles during the construction of the proposed projects. This would result in a negligible increase of vehicles on the U.S. 550 corridor and San Juan CR 7800.

Quality of Life Value	Potential Impact to Quality of Life
Noise	The current noise levels in the residential areas are assumed to be a mean value of 40 dBA Ldn. During most construction phases, the proposed projects are expected to temporarily increase daytime noise levels; however, the drilling and completion phases would potentially generate noise 24 hours per day until that phase is complete. The construction noise levels heard by the five identified noise receptors would increase from 40 dBA to a range of 55 to 68 dBA depending on the location of the noise receptor. In combination with ambient noise levels, the noise levels are expected to drop to approximately 43 dBA during the operations phase of the Proposed Action. Additional details on noise impacts are located in Section 3.5.
Scenic Quality	Visual impacts from the Proposed Action would include moderate to weak contrast to undeveloped landscapes from well pads and associated infrastructure, and the removal of vegetation. The proposed projects would meet VRM Class IV objectives while in operation, which would partially retain the existing character of the undeveloped landscape and would not dominate the view of the casual observer.
Light Pollution	Light-emitting sources associated with the construction phase of the proposed projects include lights around the working area, lights on the drilling rig (which may include lights on the derrick), vehicle traffic, and flaring. These light sources would be temporary in nature and sporadically used. Night lighting would only be used during the 24-hour construction days during well completion, would last one to two weeks per well, and would be shielded or turned to the ground whenever possible. Flaring at night would be limited to only days and times necessary for project completion. The necessity and duration for flaring varies from well to well and is difficult to predict. During operations, lighting would be limited to only that needed to conduct work safely.

3.7.4 Cumulative Impacts

3.7.4.1 CUMULATIVE IMPACT AREA

The analysis area established to measure cumulative impacts on quality of life is the census-designated geographic boundaries of the town of Nageezi, where the impacts to quality of life for the Nageezi community is likely to occur because from potential oil and gas development in the BLM FFO area.

3.7.4.2 PAST AND PRESENT ACTIONS

There is very little development beyond oil and gas and residential homes within the geographic boundaries of the town of Nageezi. Oil and gas development include both wells and associated well pad with standard infrastructure and linear pipeline and access road development (see Section 3.7.1).

3.7.4.3 REASONABLY FORESEEABLE FUTURE ACTIONS

DJR is the lease holder for all lease parcels within the Nageezi unit. Therefore, reasonably foreseeable future actions within the town of Nageezi would include future DJR oil and gas–related projects including the construction of the approved DJR NU CLF and the proposed development of DJR's Nageezi gathering system infrastructure which includes approximately 12 miles of pipeline that would transport gas between facilities and reduce the need for trucks to transport gas. Therefore, after the construction of the proposed pipeline, there would be a long-term immediate reduction of truck traffic within the town of Nageezi.

3.7.4.4 CUMULATIVE IMPACT ANALYSIS

The Proposed Action, together with past, present, and reasonably foreseeable cumulative actions, would contribute to the impacts to quality of life for Nageezi residents within the analysis area. Some of the quality of life effects from the Proposed Action, along with reasonably foreseeable future well development, would be temporary, such as the increased traffic due to construction equipment traffic, the addition of project lighting, or flaring to the landscape. However, the development of well pads would create long-term disturbance that would impact the scenic quality of the area. In addition, the completion

of the DJR NU CLF and proposed Nageezi gathering system infrastructure would result in a reduction of product transportation, which would be a long-term beneficial impact due to the reduction of traffic, fugitive dust emissions, and visual and noise impacts.

3.7.5 Mitigation and Residual Impacts

Design features (detailed in Appendix H) include measures to reduce dust, noise, and light pollution, and to limit surface disturbance, as well as the type of lighting (limited to downcast lighting with covers for safety purposes only). Additional mitigation measures are located in the Mitigation and Residual Impacts section for each resource. In addition, the BLM had the authority to implement mitigation measures as COAs to reasonably reduce resource impacts. The BLM would ensure all laws, regulations, and polices are adhered to for the life of the project. Accordingly, no further mitigation is proposed at this time.

3.8 Issue 8: How would the development of the Proposed Action impact environmental justice communities, primarily the community of Nageezi?

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," and BLM policy, requires federal agencies to determine if proposed actions have disproportionate and adverse environmental impacts on minority, low income, and American Indian populations of concern. Before determining if an environmental justice (EJ) population of concern is present, the BLM must first determine the area of analysis for the issue. The analysis area for this issue is the geographic boundary of San Juan County. This analysis area was chosen because San Juan County, specifically the Nageezi Chapter/Community may contain EJ communities that could experience the most direct impacts on quality of life as a result of the Proposed Action.

3.8.1 Affected Environment

The purpose of Executive Order 12898 is to identify and address, as appropriate, disproportionally high and adverse human health or environmental impacts on low-income populations, minority populations, or Indian Tribes that may experience common conditions of environmental exposure or effects associated with a plan or project. Environmental justice refers to the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, programs, and policies.

The Proposed Action is located within a rural area of San Juan County, New Mexico, and is located on BLM-managed land and Navajo Allotted surface. Multiple indigenous Native American populations inhabit the analysis area, and many Hispanic residents can trace their family's history of settlement of northern New Mexico back hundreds of years. These traditional and indigenous communities are intermingled with more recent Euro-American groups and immigrants. Ranchers, miners, farmers, oil and gas workers, and service industry providers are all part of the socioeconomic mixture of people in San Juan County.

The nearest community to the Proposed Action is the Nageezi community with neighborhoods of multiple houses that are approximately 1500 feet away. Data from the U.S. Census Bureau (U.S. Census Bureau 2018) on population, percent minority, percent Native American, income level, and poverty rates in the Navajo Nation Nageezi Chapter; as well as San Juan County and the state of New Mexico are provided in Table 3.23 (U.S. Census Bureau 2018).

Table 3.23. Population, Percent Minority, Percent Native American, Income Levels, and Poverty Data for Areas near the Proposed Project, including the Navajo Nation Nageezi Chapter, Towns, San Juan County, and the State of New Mexico

Location	Population	Minority (%)	Native American (%)	Per Capita Income ($)	Median Household Income ($)	Poverty Rate Per Capita Income (%)
Nageezi	261	100	94	5,740	15,375	78
Nageezi Chapter	973	100	98	9,814	21,313	48
San Juan County	125,043	62	39	22,067	44,841	24
New Mexico	2,081,015	62	9	22,146	46,748	20

Source: U.S. Census Bureau (2018).

The following EJ terminology developed by the Council of Environmental Quality (1997) is used in this analysis:

- Low-income population: A low-income population is determined based on annual statistical poverty thresholds developed by the U.S. Census Bureau. In 2017, poverty level was based on a total income of $12,752 for an individual and $25,283 for a family of four (U.S. Census Bureau 2017).
- Minority: Minorities are individuals who are members of the following population groups: American Indian, Alaskan Native, Asian, Pacific Islander, Black, or Hispanic.
- Minority population area: A minority population area is so defined if either the aggregate population of all minority groups combined exceeds 50% of the total population in the area or if the percentage of the population in the area comprising all minority groups is meaningfully greater than the minority population percentage in the broader region.
- Comparison population: For the purpose of identifying a minority population or a low-income population concentration, the comparison populations used in this analysis are the surrounding counties and the state of New Mexico.

As shown in Table 3.23, the population within the Nageezi Chapter is 100% minority and 98% Native American. The poverty rate for the Nageezi Chapter is 48%, and the poverty rate within the town of Nageezi is 78%. Per capita income for the Nageezi Chapter is below the poverty threshold, and median household income for this Chapter is below the poverty threshold as well. In general, income is lower, poverty is higher, and the percentage of minority and Native American populations is higher near the Proposed Action than in San Juan County and the state of New Mexico.

Given the above data and BLM experience with the residents and communities surrounding the Proposed Action, there are low-income, minority, and Native American populations of concern (or "Environmental Justice Populations and/or EJ communities"), as defined under Executive Order 12898, that may be disproportionately and adversely impacted by activities resulting from the proposed project.

3.8.2 Environmental Impacts- No Action Alternative

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. No resulting impacts to EJ communities would occur.

3.8.3 Environmental Impacts- Proposed Action

Conclusions about the potential for disproportionate adverse impacts on EJ populations are summarized in Table 3.24 below, and are based on analysis of other issues in this EA with consideration of the EJ populations present in close proximity to the Proposed Action. The determination of potential adverse and disproportionate impacts from specific actions is the assessment of the BLM, and should not be assumed to incorporate the position of specific, potentially impacted, EJ populations. The BLM realizes that additional impacts may be identified by local EJ populations as specific development locations and types are proposed within the community. As a result, this AIB issue assesses only the impacts for the issues identified by the BLM during internal scoping. The BLM would continue to work with affected EJ populations to identify and address additional EJ issues as they arise.

Table 3.24. Summary of Conclusions from Issues Analyzed in Detail

Issue Analyzed in Detail	Summary of Impacts	Are potential impacts disproportionate to EJ populations?
Issue 1: Air Quality	An overall 0.112% increase in NAAQS and VOC emissions as a result of the Proposed Action; localized temporary impacts from construction, particularly dust, lasting an average of 3 to 4 months per proposed project.	Yes. Short-term fugitive dust ($PM_{2.5}$ or PM_{10}) during construction may be felt more by the residents in close proximity to future potential development. These residents are considered to be EJ populations. The design features provided in Appendix H and project-specific COAs would help to minimize potential effects that could be adverse and disproportionate. Air quality is a regional resource; thus, any adverse impacts to NAAQS would not be disproportionate to EJ populations in the region.
Issue 2: Greenhouse Gas and Climate Change	All GHG emissions would contribute to global GHG emissions. The Proposed Action is estimated to result 13,601 MMT CO_2e from construction and operation and 1,423,500 MMT CO_2e from downstream GHG emissions. GHG emissions are associated with documented ongoing and reasonably foreseeable climate-related effects that may affect quality of life. For the San Juan Basin (southern Colorado to central southern New Mexico), these may include increased temperatures, decreases in overall water availability, and increases in frequency, intensity, and duration of both droughts and floods (BLM 2018b). However, the incremental contribution to global GHGs from the Proposed Action cannot be translated into any specific impact on climate change globally or regionally.	No. Any increase in GHG emissions that could impact climate change as described in the analysis would be regional or global in nature and would not be disproportionately borne by EJ populations in the region.

Issue Analyzed in Detail	Summary of Impacts	Are potential impacts disproportionate to EJ populations?
Issue 3: Water Quantity and Quality	6.44 AF per proposed well are anticipated for use in potential future development. The estimated water use would comprise less than 0.005% of the 2015 San Juan Basin total water use, 0.039% of 2015 San Juan Basin total groundwater use, and would result in a 0.016% increase over 2015 water use in the mining category for the San Juan Basin. With consideration of design features and regulatory requirements, no impacts to groundwater or surface water quality is expected from well drilling and completion. Spills could occur that could affect groundwater or surface waters.	Yes. While groundwater resources are regional in nature and water withdrawal is not anticipated to affect domestic water sources, any potential impacts on local water wells (for example, a spill that affects groundwater) could force residents to find other means of supplying water for domestic use. These residents are EJ populations. Design features and COAs would help to minimize this risk. Should a spill occur, the BLM would work with the NMOCD and/or the Navajo Nation Environmental Protection Agency to immediately remediate spills in accordance with federal and state standards, including 19.15.29.11 NMAC and the Navajo Nation Clean Water Act 104(a)(2)(C), 4 Navajo Nation Code 1304(A)(2)(c) (Navajo Nation 2014).
Issue 4: Traffic and Safety	Approximately 116 roundtrips for heavy and light vehicles on the U.S. 550 corridor and San Juan CR 7820 during construction of the proposed project. This would result in a negligible increase along the U.S. 550 corridor and San Juan CR 7800.	Yes. Any impacts associated with truck traffic and safety on U.S. 550 would be regional in nature and impacts would not be disproportionate to EJ populations in the region. However, the increase in truck traffic on San Juan CR 7800 would be localized to the access roads utilized by the Nageezi community. Therefore, there is the potential for the Proposed Action to disproportionately impact traffic congestion and risk of incident, for EJ populations along San Juan CR 7800. The design features provided in Appendix H and project-specific COAs would help to minimize potential effects that could be adverse.
Issue 5: Noise	The Proposed Action would increase noise from 40 dBA to a range of 55 to 68 dBA depending on the location of the residence in relation to the proposed projects. During most construction phases, the proposed projects are expected to temporarily increase daytime noise levels; however, the drilling and completion phases would potentially generate noise 24 hours per day until that phase is complete. Noise levels are expected to drop to approximately 43 dBA during the operations phase of the Proposed Action.	Yes. Any impacts associated with noise would be greater for the residents in close proximity to the proposed projects. These residents are an EJ population. Design features outlined in Appendix H and project-specific COAs would be applied to reduce effects that could be adverse and disproportionate to EJ populations.
Issue 6: Scenic Quality	Visual impacts from the proposed projects well pads would present moderate to weak visual contrast and would be noticeable and distinct from the residential areas in proximity to the proposed project areas.	Yes. Visual impacts associated with construction and operation of the proposed projects would create visual impacts that are greater for the residents that are within the viewshed of the project area. These residents are considered an EJ population. Design features outlined in Appendix H and project-specific COAs would be applied to reduce effects that could be adverse and disproportionate to the EJ population.
Issue 7: Quality of Life	Potential for localized air, noise, visual resources, and traffic and safety impacts that could affect quality of life, particularly during construction. Continued expansion of the oil and gas industry may be perceived as having a negative effect on quality of life for people who value undeveloped landscapes.	Yes. In general, quality of life values could be impacted during construction and operation and would be greater for the residents in close proximity to the proposed projects. These residents are an EJ population. Design features outlined in Appendix H and project-specific COAs would be applied to reduce effects that could be adverse and disproportionate to the EJ population.

Issue Analyzed in Detail	Summary of Impacts	Are potential impacts disproportionate to EJ populations?
Issue 9 Special-Status Plant Species	There is no suitable habitat present for Clover's cactus (*Sclerocactus cloverae*) within or adjacent to the NU G35 and NU B02 project areas. In addition, there is marginal habitat for this species within and adjacent to the NU H33 and suitable/occupied habitat within the NU M35 project area. The Proposed Action would remove approximately 49.5 acres of marginal to suitable/occupied Clover's cactus habitat. This would total a habitat loss of less than 0.0001% of the total available habitat.	No. Any loss of marginal to suitable/occupied Clover's cactus habitat would not be adverse or disproportionate to the EJ population.

3.8.4 Cumulative Impacts

3.8.4.1 CUMULATIVE IMPACT AREA

The analysis area established to consider cumulative impacts on EJ populations is the geographical boundaries of San Juan County, where the impacts to quality of life for the Nageezi community is likely to occur from potential oil and gas development in the BLM FFO area.

3.8.4.2 PAST AND PRESENT ACTIONS

There is very little development beyond oil and gas and residential homes within the geographic boundaries of the town of Nageezi. Oil and gas development include both wells and associated well pad with standard infrastructure and linear pipeline and access road development

3.8.4.3 REASONABLY FORESEEABLE FUTURE ACTIONS

DJR is the lease holder for all lease parcels within the Nageezi unit. Therefore, reasonably foreseeable future actions within the Nageezi Chapter would include future DJR oil and gas–related projects including the construction of the approved DJR NU CLF and the proposed development of DJR's Nageezi gathering system infrastructure which includes approximately 12 miles of pipeline. Other effects, such as the addition of oil and gas facilities to the region, would be relatively longer term, and would be in use for the lifetime of the foreseeable projects. In addition, the proposed Nageezi gathering system would transport gas between facilities and reduce the need of trucks for gas transport, there would be a long-term immediate reduction of transportation truck traffic within the town of Nageezi. Other actions within the town of Nageezi would include residential development, which would introduce temporary disturbances from increased traffic, and noise and fugitive dust due to construction.

3.8.4.4 CUMULATIVE IMPACT ANALYSIS

The Proposed Action, together with past, present, and reasonably foreseeable cumulative actions, would disproportionately impact the EJ community within the analysis area. In general, the disproportionate impacts on the EJ population include issues related to air quality, water quality, traffic and safety, noise, scenic quality, and quality of life. Some of the quality of life effects from the Proposed Action together with reasonably foreseeable future well development would be temporary, such as the increased traffic due to construction equipment traffic, and the addition of project lighting, or flaring to the landscape. However, the completion of the approved DJR NU CLF and proposed DJR gathering system would reduce the impacts from transportation, which would result in the reduction of traffic, fugitive dust emissions, and visual and noise impacts.

3.8.5 Mitigation and Residual Impacts

DJR is coordinating an outreach program with the Navajo Nation Nageezi Chapter to conduct informational meetings to allow residences the opportunity to identify adverse environmental impacts that may occur as a result of the proposed project and reasonably future projects in the analysis area. Design features (detailed in Appendix H) include measures to reduce dust, noise, and light pollution, and to limit surface disturbance to protect natural and cultural resources, as well as the type of lighting (limited to downcast lighting with covers for safety purposes only). Additional mitigation measures are located in the Mitigation and Residual Impacts section for each resource. The BLM would ensure all laws, regulations, and polices are adhered to for the life of the Proposed Action. Accordingly, no further mitigation is proposed at this time.

3.9 Issue 9: How would the Proposed Action, particularly the proposed NU M35 and NU H33 project areas, impact suitable habitat for Clover's cactus?

The Proposed Action is within the BLM FFO–delineated potential habitat zone for Clover's cactus (*Sclerocactus cloverae*) (BLM 2018a) which is listed by the BLM as a sensitive species. Clover's cactus is also listed as endangered by the State of New Mexico and as a Navajo Endangered Species List Group 4 species. Loss of habitat and habitat fragmentation are the primary impact-causing elements that could impact Clover's cactus. The analysis area is the combined BLM-delineated Clover's cactus suitable habitat zone and the Clover's cactus and Aztec gilia (*Aliciella formosa*) suitable habitat zone totaling 358,979.69 acres. The impact indicator would be the amount of available suitable Clover's cactus habitat removed from the BLM-delineated habitat zones.

Key assumptions for the analysis of impacts to Clover's cactus habitat are as follows:

- In 2016–2017, the previously determined subspecies Brack's hardwall cactus (*Sclerocactus cloverae* ssp. *brackii*) underwent a BLM-funded genetic study and classification review to inform the management of the cacti species and subspecies. The study determined that there is not a genetic foundation for the subspecies determination and the cacti should be classified under a single species as a cohesive genetic pool, *Sclerocactus cloverae*, common name Clover's cactus (BLM 2018c). For the purpose of this analysis, Brack's cactus is referred to Clover's cactus.

3.9.1 Affected Environment

In April 2017, the BLM FFO released an Instruction Memorandum (IM) to provide guidance on habitat management of Clover's cactus and Aztec gilia for ground-disturbing projects on BLM-managed land (BLM 2017). Within this IM, the BLM provided mapped suitable habitat, including a habitat zone that consists of suitable Clover's cactus habitat only and a habitat zone for both Clover's cactus and Aztec gilia. Combined, the habitat zones consist of 358,979.69 acres. All four project areas associated with the Proposed Action are within the BLM-mapped suitable habitat zone for Clover's cactus.

The IM also defines the area of impact when evaluating project-specific surface disturbance impacts to suitable and occupied Clover's cactus and Aztec gilia habitat. The area of impact is defined as the project footprint created by surface-disturbing activities associated with construction and an additional 30-meter buffer. The additional 30-meter buffer to the project area ensures adequate analysis of indirect impacts to Clover's cactus habitat associated with construction activities, such as fugitive dust and sediment transport, weed invasion, and the potential for unauthorized vehicular activities.

The BLM evaluated the habitat for Clover's cactus during the December 2019 on-site visit for the proposed projects. In addition, SWCA performed biological surveys of the proposed project areas in July 2018 (NU M35), July 2019 (NU B02), and December 2019 (NU G35 and NU H33). SWCA prepared a biological survey report and biological evaluation (BSR/BE) for the projects describing the results of the biological survey and submitted to the BLM and Navajo Nation Department of Fish and Wildlife (NNDFW) in April 2020 (SWCA 2020). An approved biological resources compliance form was provided by the Navajo Nation Department of Fish and Wildlife and is provided in Appendix L. Based on the on-site survey and the BLM's review of the BSR/BE, the BLM determined that there was no suitable habitat present for Clover's cactus within or adjacent to the NU G35 and NU B02 project areas. In addition, the BLM determined that the NU M35 was within occupied and suitable Clover's cactus habitat (see Map E.2 in Appendix E) and that there was marginal habitat for this species within and adjacent to the NU H33 project area (see Map E.5 in Appendix E) (BLM 2019b, 2020f). Detailed information can be found in the BSR/BE for the Project Action on file with the BLM FFO.

3.9.2 Environmental Impacts- No Action Alternative

Under the No Action Alternative, the BLM would deny approval of the APDs. DJR would retain its lease rights, but the Proposed Action would not occur. Production in the area would continue at its current rate, and other current land use in the area would continue. No impacts to suitable or occupied Clover's cactus would ensue. The suitable and occupied habitat would remain undisturbed within the BLM-delineated habitat zone for this species; thus the proposed projects would not contribute to habitat fragmentation.

3.9.3 Environmental Impacts- Proposed Action

3.9.3.1 CLOVER'S CACTUS HABITAT LOSS

The proposed NU M35 and NU H33 project areas would directly remove approximately 20.8 acres of marginal to suitable Clover's cactus habitat due to surface disturbance associated with project construction. Per the BLM's IM for this species, the area of potential impact to suitable habitat includes an additional 30-meter buffer around the project area. Therefore, the proposed NU M35 and NU H33 project areas would create an additional 28.7 acres of indirect impacts to marginal to suitable habitat for this species. Combined, the Proposed Action would directly and indirectly impact approximately 49.5 acres of marginal to suitable/occupied Clover's cactus habitat. This acreage comprises a loss of less than 0.0001%, from vegetation removal within the BLM-delineated habitat zones for this species.

As a result of construction activities from the proposed projects, dust would also be generated from vegetation removal activities, as well as from vehicle traffic during construction and operation activities. Dust could negatively impact suitable habitat adjacent to the proposed project areas. Dust can alter vegetation's photosynthetic processes by changing the plants respiration and transpiration. Dust can also elevate the risk of phytotoxic gaseous pollutants to penetrate a plant. In general, there is a greater decrease in plant community productivity from increased dust levels (Farmer 1991). However, DJR would adhere to the mitigation measures outlined in Section 3.9.5 to limit fugitive dust impacts to suitable habitat.

Vegetation removal could also increase the likelihood for non-native plants and noxious weed invasion within suitable and occupied habitat for Clover's cactus adjacent to the areas of disturbance. If non-native plants and noxious weeds were to become established as a result of vegetation removal to the surrounding suitable and occupied habitat zones, it could negatively affect this species by changing the vegetation composition and limiting opportunities for this species to reproduce due to plant competition for resources. However, after construction, DJR would control weed populations within and surrounding the project areas to the best of their abilities per the mitigation outlined within Section 3.9.5.

For the NU M35 project area, DJR moved the original proposed staging area (0.6 acre) to the south side of the access road to avoid direct impacts resulting from construction activities to suitable habitat. DJR also reduced the size of the NU M35 well pad (<0.1 acre) by rounding the southeastern corner to directly avoid one of the identified suitable habitat areas. For the current proposed project surface disturbance areas, specifically the NU M35 project area, DJR has reduced surface disturbance within the BLM-designated habitat "zone" for Clover's cactus to the maximum extent practicable.

3.9.3.2 CLOVER'S CACTUS HABITAT FRAGMENTATION

The proposed NU M35 and NU H33 project areas would create habitat fragmentation to the BLM-delineated Clover's cactus habitat zones. Currently the BLM-delineated habitat zones are disturbed from existing oil and gas activities and residential areas. Habitat fragmentation could impact the genetic diversity of this species by eliminating opportunities for pollinators to disperse seeds in suitable habitat zones that are undeveloped. Habitat fragmentation could also impact the viability and longevity of this species as reproduction opportunities could become disjointed from limited pollinator opportunities (BLM 2017).

However, prior to construction, DJR would adhere to the mitigation measures outlined in Section 3.9.5., including using a BLM-approved third-party contractor to conduct a species-specific survey for Clover's cactus to identify any individual species and perform a transplant if necessary.

3.9.4 Cumulative Impacts

3.9.4.1 CUMULATIVE IMPACT AREA

The analysis area established to cumulative impacts on Clover's cactus habitat is the combined 358,979.69-acre BLM-delineated habitat zones for Clover's cactus.

3.9.4.2 PAST AND PRESENT ACTIONS

There is very little development beyond oil and gas and residential homes within the BLM-delineated habitat zones for Clover's cactus. Oil and gas development include both wells and associated well pad with standard infrastructure and linear pipeline and access road development.

3.9.4.3 REASONABLY FORESEEABLE FUTURE ACTIONS

DJR is the lease holder for all lease parcels within the Nageezi unit. Therefore, reasonably foreseeable future actions within the BLM-delineated Clover's cactus habitat zones would include future DJR oil and gas–related projects including the construction of the approved DJR NU CLF and the proposed development of DJR's Nageezi gathering system infrastructure which includes approximately 12 miles of pipeline that would result in a reduction of product transportation, which would be a long-term beneficial impact due to the reduction of traffic noise. Other effects, such as the addition of oil and gas facilities to the region, would be relatively longer term, and would be in use for the lifetime of the foreseeable projects. In addition, the proposed Nageezi gathering system would reduce the need of trucks for gas transport. Other actions within the town of Nageezi would include residential development, which could introduce direct and indirect disturbances from increased traffic and fugitive dust to nearby suitable and occupied Clover's cactus habitat.

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3.9.4.4 CUMULATIVE IMPACT ANALYSIS

The Proposed Action, together with past, present, and reasonably foreseeable cumulative actions, would incrementally contribute to the density of development and overall habitat fragmentation in the analysis area. However, the reduction (0.0001%) of available habitat resulting from the Proposed Action (vegetation clearing from construction) would not be significant when compared with the amount of available similar habitat.

An increase in dust and invasive plants could cumulatively lead to indirect increased habitat fragmentation. However, the mitigation to control dust and weeds would aid in eliminating cumulative habitat fragmentation for Clover's cactus.

3.9.5 Mitigation, Stipulation and Residual Impacts

In addition to the Wildlife, Migratory Birds, and Special-Status Species Design Features (Appendix H), the following stiplations would be implemented to limit impacts to Clover's cactus:

Pre-construction Species Specific Survey for Clover's Cactus: Prior to construction of the NU M35 project area, a BLM/FFO biologist or a BLM/FFO-approved 3rd party biologist would conduct a preconstruction species-specific survey to identify individual Clover's cactus. The survey area would consist of the project area boundary and an additional 30-meter buffer, as per survey protocol. The approved biologist would coordinate with the BLM prior on the species-specific survey to ensure the Clover's cactus survey protocols are met in a timely fashion.

- **Clover's Cactus Transplant Plan and Permitting Preparation:** Per the BLM policy (IM NMFO 1210-2017-003) , if any individual Clover's cactus species identified in the preconstruction survey, the proposed project area would require a transplant operation led by a BLM-approved horticulturist. A third-party contractor would coordinate with the BLM and BLM-approved horticulturist in preparation of a transplant plan that will include all the details the transplant operation to be submitted to the New Mexico's BLM-State Office for approval. Once the BLM approves the transplant plan, these documents would be submitted to the State of New Mexico's EMNRD (Forestry Division) to attain the required transplant permit (as per NMAC 19.21.2- amended).

- **Clover's Cactus Monitoring of Transplant Plot:** Per the BLM IM # NMFO 1210-2017-003 , any transplanting that requires monitoring will be monitored for a minimum of 5 years following transplanting effort(s) or until the BLM relieves the proponent from monitoring responsibilities. During monitoring activities, baseline data would be collected, and the monitoring results would be submitted to the BLM on an annual basis. The guidelines outlined in the BLM IM for monitoring activities would be adhered to

Temporary Fencing: DJR would install a temporary fence near the southeast corner of the NU M35 during construction to prevent disturbance to Clover's cactus occupied/suitable habitat.

- **Weed Control:** To the best of DJR's abilities (including an independent construction/weed contractor), weed populations would be controlled. If pesticides are used, DJR would avoid pesticide drift when applying pesticides. The FFO weed coordinator would approve any spraying within special-status plant species suitable habitat, especially during the flowering season. Spraying is not recommended during sustained winds higher than 5 miles per hour.

- **Dust Control:** DJR would apply fresh water for dust abatement. Dust abatement applications would be comprised of fresh water only, with no use of magnesium chloride without authorization from the BLM.

4 Consultation and Coordination

4.1 ESA Consultation

BLM FFO biologists have reviewed the Proposed Action and determined it would comply with threatened and endangered species management guidelines outlined in the biological assessment associated with the PRMP/FEIS (see Table 1.2 and the NEPA IDT checklist [Appendix G].).

In 2014, the yellow-billed cuckoo (*Coccyzus americanus*) was listed as threatened with proposed critical habitat. There is no nesting habitat for this species within or adjacent to the proposed project area. The nearest designated critical habitat for this species is 30 miles to the north. Therefore, the Proposed Action would not impact this species.

The New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) was listed as endangered in 2014. There is no riparian habitat within or adjacent to the proposed project area. The nearest designated critical habitat for this species is 54 miles to the north-northeast. Therefore, the Proposed Action would not impact this species.

4.2 Tribal Consultation

Tribal consultation for the Proposed Action was initiated on a government-to-government basis by the BLM FFO with various Pueblos and Tribes of New Mexico and southern Colorado. A letter and map describing the proposed project and inviting consultation with the BLM FFO was sent via certified mail to each of the various Pueblos and Tribes listed in Table 4.1 on February 11, 2020 with a request for response within 30 days of receipt.

Table 4.1. Pueblos and Tribes Who Received Consultation Requests from the BLM FFO

Tribe	Name
All Pueblos Council of Governors	Governors
Eight Northern Indian Pueblos Council	Governors
Five Sandoval Indian Pueblos	Governors
Jicarilla Apache Tribal Council	President Darrell Paiz
Kewa Pueblo (Pueblo of Santo Domingo)	Governor Thomas Moquino, Jr
Nageezi Chapter House	President Ervin Chavez
Navajo Nation	President Jonathan Nez
Ohkay Owingeh	Governor Ron Lovato
Pueblo of Acoma	Governor Brian Vallo
Pueblo of Cochiti	Governor Charles Naranjo
Pueblo of Isleta	Governor Max Zuni
Pueblo of Isleta, Tribal Historic Preservation Office	Dr. Henry Walt
Pueblo of Jemez	Governor David Toledo

Tribe	Name
Pueblo of Laguna	Governor Wilfred Herrera, Jr.
Pueblo of Nambe	Governor Phillip A. Perez
Pueblo of Nambe, Tribal Historic Preservation Office	Lt. Governor Arnold J. Garcia
Pueblo of Picuris	Governor Craig Quanchello
Pueblo of Pojoaque	Governor Joseph M. Talachy
Pueblo of San Felipe	Governor Anthony Ortiz
Pueblo of San Felipe Department of Natural Resources	Pinu'u Stout, Director
Pueblo of San Ildefonso	Governor Perry Martinez
Pueblo of Sandia	Governor Lawrence Montoya
Pueblo of Santa Ana	Governor Timothy Menchego
Pueblo of Santa Ana Tribal Historic Preservation Office	Director Timothy Menchego
Pueblo of Santa Clara	Governor J. Michael Chavarria
Pueblo of Taos	Governor Edward Concha
Pueblo of Tesuque	Governor Robert Mora, Sr
Pueblo of Zia	Governor Fredrick Medina
Pueblo of Zuni	Governor Val R. Panteah, Sr.
Southern Ute Indian Tribe	Chairwoman Christine Baker-Sage
Ten Southern Pueblo Governor's Council	David Toledo, Chair
The Hope Tribe	Chairman Timothy L. Nuvangyaoma
Ute Mountain Ute Tribe	Chairman Manuel Hart

In response to the consultation letter, a consultation request was received by the BLM from the Navajo Nation Heritage and Historic Preservation Department. This letter indicated that a sensitive cultural area was present in the vicinity of the proposed project location, and requested that the BLM conduct ethnographic work to inform the local community about this project and to see if they had questions or concerns about the proposed work. La Plata Archaeological Contractors completed this ethnographic work and submitted a report of this work to the BLM-FFO on March 19th, 2020. During this work, locals stated that the location of the sensitive area was actually misplotted and that this location wouldn't be effected by the proposed project. Consultation was deemed complete by the BLM Authorized Officer on 10/22/2020.

4.3 New Mexico State Historic Preservation Office (SHPO) Consultation

Section 106 of the National Historic Preservation Act of 1966 (NHPA) and its implementing regulations require federal agencies to consider what impact their licensing, permitting, funding, or otherwise authorizing an undertaking, such as an APD or ROW, may have on properties listed in or eligible for listing in the National Register of Historic Places. Specific definitions for key cultural resources management concepts (such as undertakings, impacts, and areas of potential effect) are provided in 36 CFR 800.16.

The New Mexico BLM has a two-party agreement with the SHPO (hereafter referred to as the Protocol) that implements an authorized alternative to 36 CFR 800 for most undertakings (BLM and SHPO 2014).

The Protocol offers a streamlined process for reporting and review that expedites consultation with the SHPO.

The entire area of potential effect (APE) associated with the Proposed Action was archaeologically surveyed by La Plata Archaeological Consultants (LPA) at a BLM Class III level (100%), and reports were prepared and submitted to the BLM. Below is a summary of the findings.

- **NU M35:** A Class III Archaeological Survey (NMCRIS No. 141538; BLM Report No. 2019(I)007F) was conducted in this proposed project area. During this survey, two sites were discovered, one of which was determined to be Eligible for listing on the NRHP, and the other site was given a Not Determined eligibility status. Both sites would have temporary site protection fencing and the presence of an archaeological monitor. These stipulations can be found in the In-House Survey Determination Form NM-210-2020-028. The G-Tank and Staging area were also inventoried at the Class III level (NMCRIS No. 144909; BLM Report No. 2020(II)011F). During this inventory, no cultural sites were discovered; therefore, no specific site protection stipulations will be required for this portion of the project. One more survey associated with this project was completed on tribal land (HPD-20-062). During this survey, one cultural site was discovered (NM-G-47-56). This site was determined to be Not Eligible for listing on the NRHP, and will not require any additional work. With adherence to the above mentioned stipulations, this portion of the project will have No Effect to Historic Properties.
- **NU G35:** A Class III Archaeological Survey (NMCRIS No. 144851; BLM Report No. 2020(II)013F) was conducted in this proposed project area. During this survey, two sites were discovered, both of which were given a Not Determined eligibility status. Both sites will require temporary site protection fencing and the presence of an archaeological monitor. With adherence to these stipulations, the proposed project will have No Effect to Historic Properties.
- **NU B02:** A Class III Archaeological Survey (NMCRIS No. 144910; BLM Report No. 2020(II)010F) was conducted in this proposed project area. During this survey, no cultural sites were discovered; therefore, no specific site protection stipulations will be required for this project. The proposed project will have No Effect to Historic Properties.
- **NU H33**: A Class III Archaeological Survey (NMCRIS No. 144852; BLM Report No. 2020(II)012F) was conducted in this proposed project area. During this survey, two cultural sites were discovered; both of which were given Not Determined eligibility statuses for listing on the NRHP. Both sites will require temporary fencing and the presence of an archaeological monitor. The proposed project will have No Effect to Historic Properties.

5.0 List of Appendices

Appendix A: List of Preparers

This EA has been prepared on behalf of the BLM by a contractor (SWCA Environmental Consultants [SWCA]) to comply with the requirements and guidelines prescribed by the BLM FFO. Portions of this document may be altered or written by the BLM FFO, as the BLM has the ultimate responsibility for the content of the EA. The table below contains a list of individuals that contributed to or reviewed this EA.

List of EA Preparers

Name	Area of Expertise	Organization
Gary Smith	Natural Resource Specialist / Project Lead	BLM FFO
Kimberly Adams	Archaeologist	BLM FFO
Chris Wenman	Geologist	BLM FFO
Stanley Allison	Outdoor Recreation Planner	BLM FFO
Lola Henio	Tribal Liaison	BLM FFO
Tamara Faust	Lands/Access	BLM FFO
C. Gould	Range	BLM FFO
Heather Perry	Natural Resource Specialist	BLM FFO
John Kendall	Threatened and Endangered Species Biologist	BLM FFO
Jeff Tafoya	Natural Resource Specialist	BLM FFO
Ryan Joyner	Planning and Environmental Coordinator	BLM FFO
Whitney Thomas	Physical Scientist	BLM FFO
Kelly Haun	Project Manager	SWCA
Janet Guinn	Senior NEPA QA/QC	SWCA
Sarah Griffin	NEPA and Environmental Planner	SWCA
Max Wiegmann	NEPA Specialist	SWCA
Paul Makarewicz	NEPA Specialist	SWCA
Alex Simons	NEPA Specialist	SWCA
Andrea McArdle	NEPA Specialist	SWCA

Appendix B: Acronyms and Abbreviations

2018 RFD	The Reasonably Foreseeable Development Scenario for Oil and Gas Activities: Mancos-Gallup Resource Management Plan Amendment (RMPA) Planning Area, Farmington Field Office, northwestern New Mexico
AADT	annual average daily traffic
AF	acre-feet
APD	Application for Permit to Drill
APE	area of potential effect
AQI	Air Quality Index
ARPA	Archaeological Resources Protection Act
BART	Best Available Retrofit Technology
bbl	barrel
BLM	Bureau of Land Management
BMP	best management practice
BSR/BE	biological survey report and biological evaluation
CAA	Clean Air Act
CFR	Code of Federal Regulations
CH_4	methane
CLF	central liquid facility
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COA	condition of approval
CR 7800	County Road 7800
CRCF	Cultural Resource Compliance Form
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DJR	DJR Operating, LLC
EA	Environmental Assessment
EJ	environmental justice
EMNRD	New Mexico Energy, Minerals and Natural Resources Department
EO	Executive Order

EPA	U.S. Environmental Protection Agency
FFO	Farmington Field Office
FIMO	Federal Indian Minerals Office
GHG	greenhouse gas
GMST	global mean surface temperature
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
IDT	Interdisciplinary Team
IM	Instruction Memorandum
IPCC	International Panel on Climate Change
KOP	key observation point
Ldn	24-hour average sound level
MBTA	Migratory Bird Treaty Act of 1918
mg/l	milligrams per liter
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NATA	National Air Toxics Assessment
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act of 1966
NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
NMCRIS	New Mexico Cultural Resource Information System
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMOCD	New Mexico Oil Conservation Division
NMSO	New Mexico State Office
NO_2	nitrogen dioxide
NO_x	nitrogen oxide(s)
NORM	naturally occurring radioactive material
NU	Nageezi Unit
O_3	ozone

Pb	lead
PDO	Pecos Distract Office
PL	Public Law
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns in diameter
PM_{10}	particulate matter equal to or less than 10 microns in diameter
ppm	parts per million
PRMP/FEIS	Proposed Resource Management Plan and Final Environmental Impact Statement
proposed project	Nageezi Units 2309-2409 Cluster Oil Wells Project
PUP	pesticide use proposal
RCP	representative concentration pathway
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
ROW	right-of-way
SHPO	New Mexico State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
Stat.	Statute
Sundry Notice	Sundry Notices and Reports on Wells Form 3160-5
SUPO	Surface Use Plan of Operations
SWCA	SWCA Environmental Consultants
TCP	traditional cultural property
TDS	total dissolved solids
TUA	temporary use area
U.S. 550	U.S. Highway 550
USC	United States Code
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
VRM	Visual Resource Management
WESTAR-WRAP	Western States Air Resources Council – Western Regional Air Partnership

Appendix C: List of References

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Appendix D: Figures

Figure D.1. NU M35: Overview of sagebrush shrubland vegetative community from the southwest corner of the proposed pad, facing northeast toward the proposed wellheads.

Figure D.2. NU M35: Overview of sagebrush shrubland vegetative community from the northwest corner of the proposed pad, facing southeast toward the proposed wellheads.

Figure D.3. NU M35: Clover's cactus observed north of the access road corridor. DJR moved the original proposed staging area (0.6 acre) to the south side of the access road to avoid impacts to this area.

Figure D.4. NU M35: Individual Clover's cactus observed within the proposed pad at the northwest corner.

Figure D.5. NU M35: Three Clover's cactus individuals observed within the southeast corner of the original proposed pad. DJR reduced the size of the pad to avoid impacts to this area; note the cutoff corner in Map E.2.

Figure D.6. NU M35: The proposed access road and pipeline corridor; view facing southwest from the southwestern corner of the proposed pad.

Figure D.7. NU M35: Overview of sagebrush shrubland vegetative community, facing east where the access road intersects with Road 7800. The G-tank and staging area are located along the south side of the access road.

Figure D.8. NU G35: View facing west from the east corner of the proposed pad.

Figure D.9. NU G35: View facing south from the north corner of the proposed pad.

Figure D.10. NU G35: View facing north from the south corner of the proposed pad.

Figure D.11. NU G35: View facing east from the west corner of the proposed pad.

Figure D.12. NU B02: View facing southwest from the proposed access road.

Figure D.13. NU B02: View facing south from the northeast corner of the proposed pad.

Figure D.14. NU B02: View facing west from the northeast corner of the proposed pad.

Figure D.15. NU B02: View facing east from the northwest corner of the proposed pad.

Figure D.16. NU B02: View facing south from the northwest corner of the proposed pad.

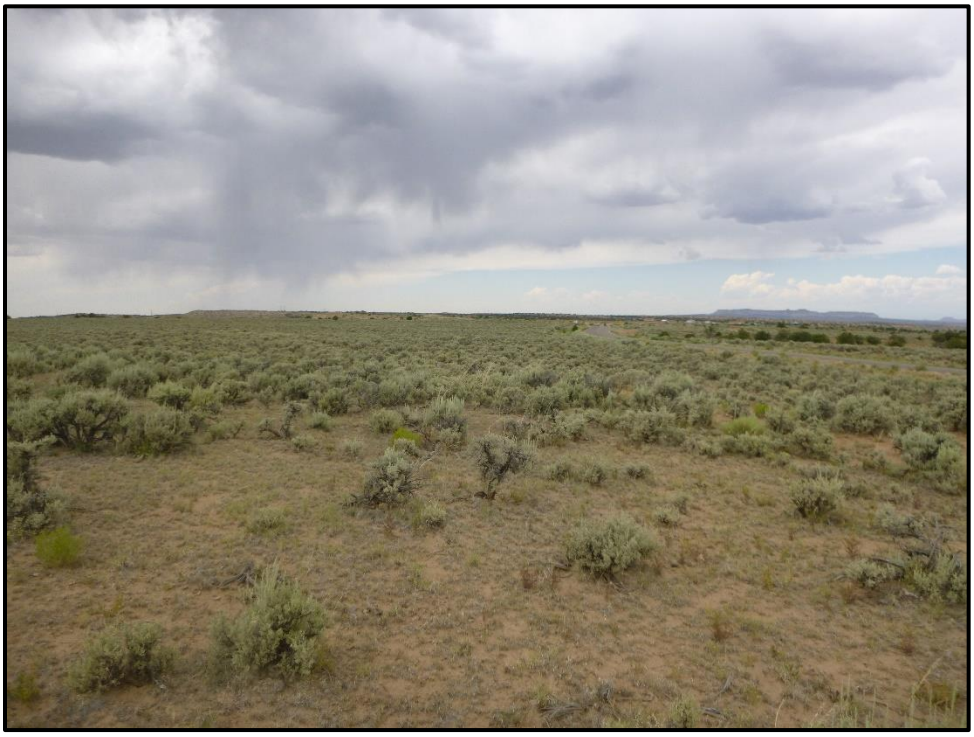


Figure D.17. NU B02: View facing southwest from the pipeline corridor.

Figure D.18. NU B02: View facing north from the southern terminus of the pipeline corridor.

Figure D.19. NU B02: View where the pipeline corridor will cross the proposed access road to the NU M35 project area and a TUA will be located.

Figure D.20. NU H33: View facing southwest toward the proposed wellheads from the northeast corner of the proposed pad.

Figure D.21. NU H33: View facing south across the proposed pad from the north side of the proposed pad.

Figure D.22. NU H33: View facing northeast toward the proposed wellheads from the southwest corner of the proposed pad.

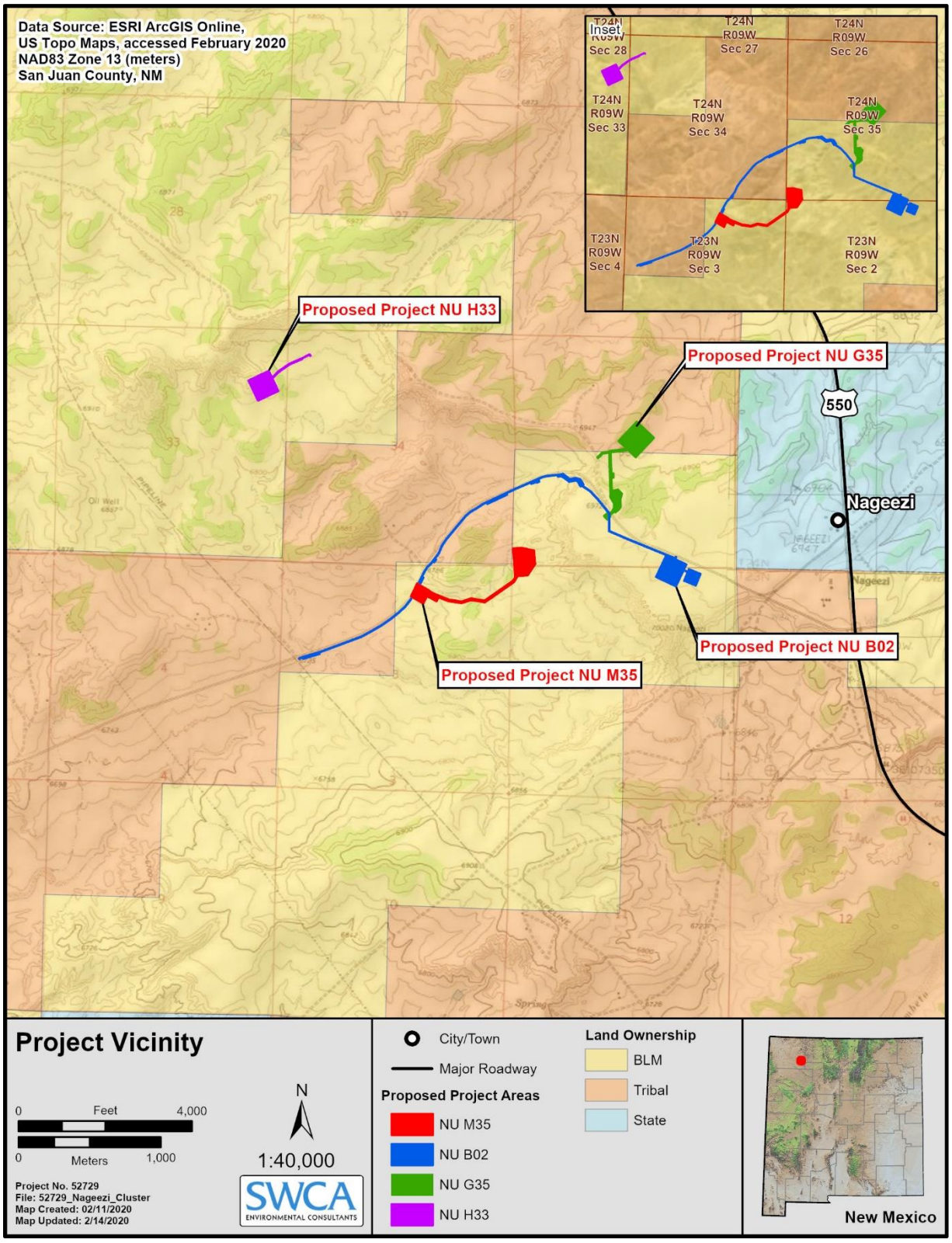
Figure D.23. NU H33: View facing northwest toward the proposed wellheads from the southeast corner of the proposed pad.

Figure D.24. KOP 1: View facing southwest toward the B02 pad and facility site.

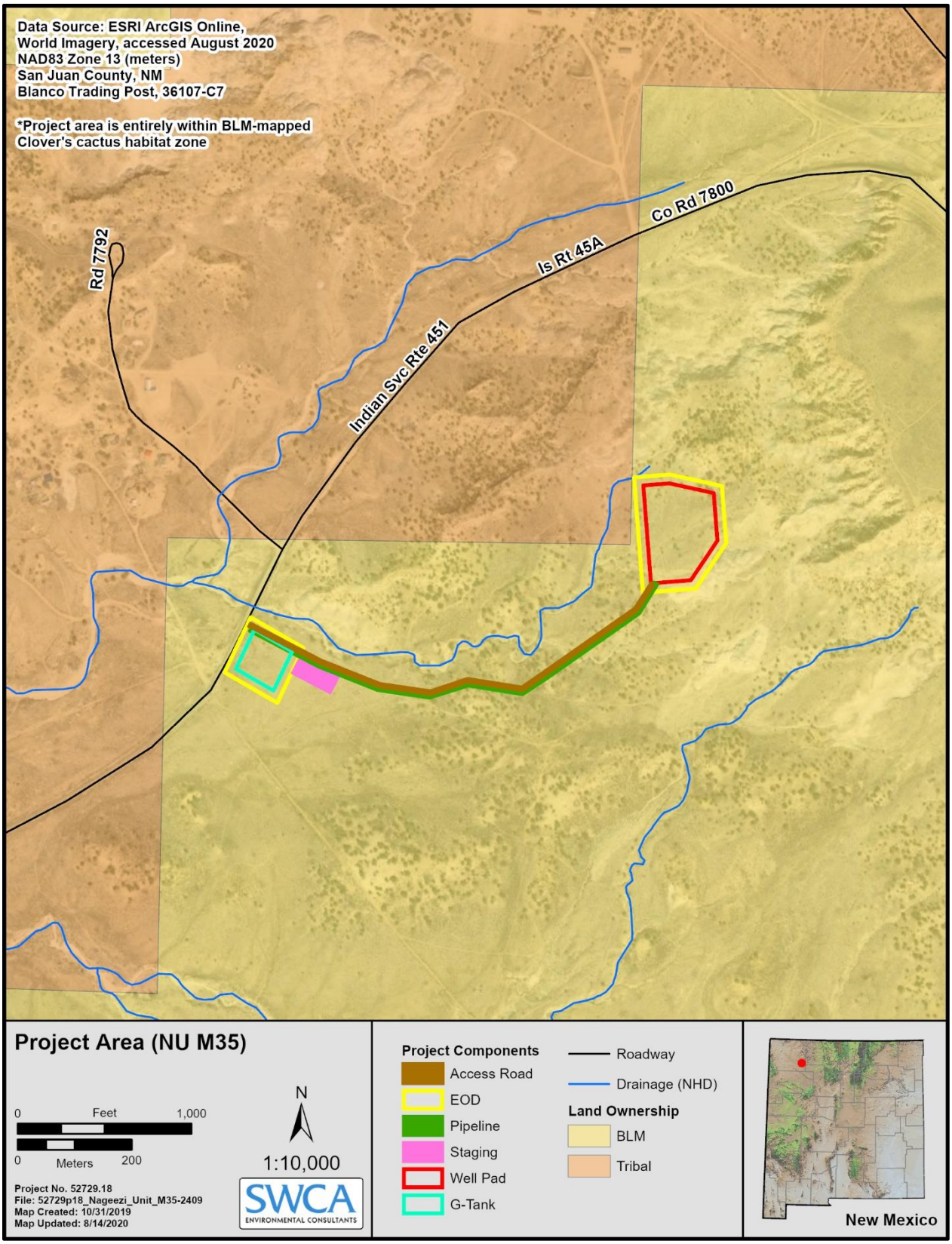
Figure D.25. KOP2: View facing northwest toward the B02 pad and facility site.

Figure D.26. KOP3: View facing east toward the M35 pad.

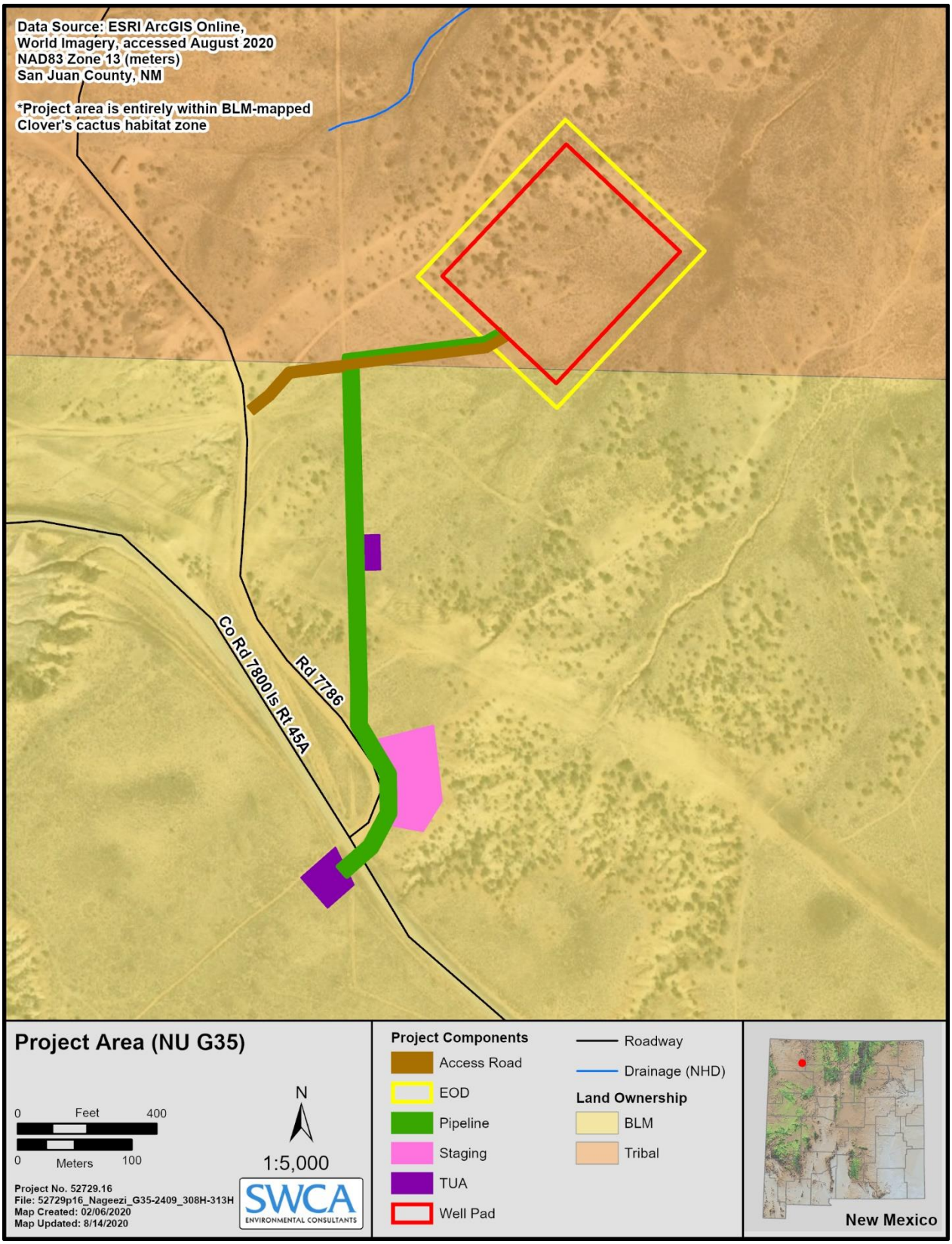
Appendix E: Maps



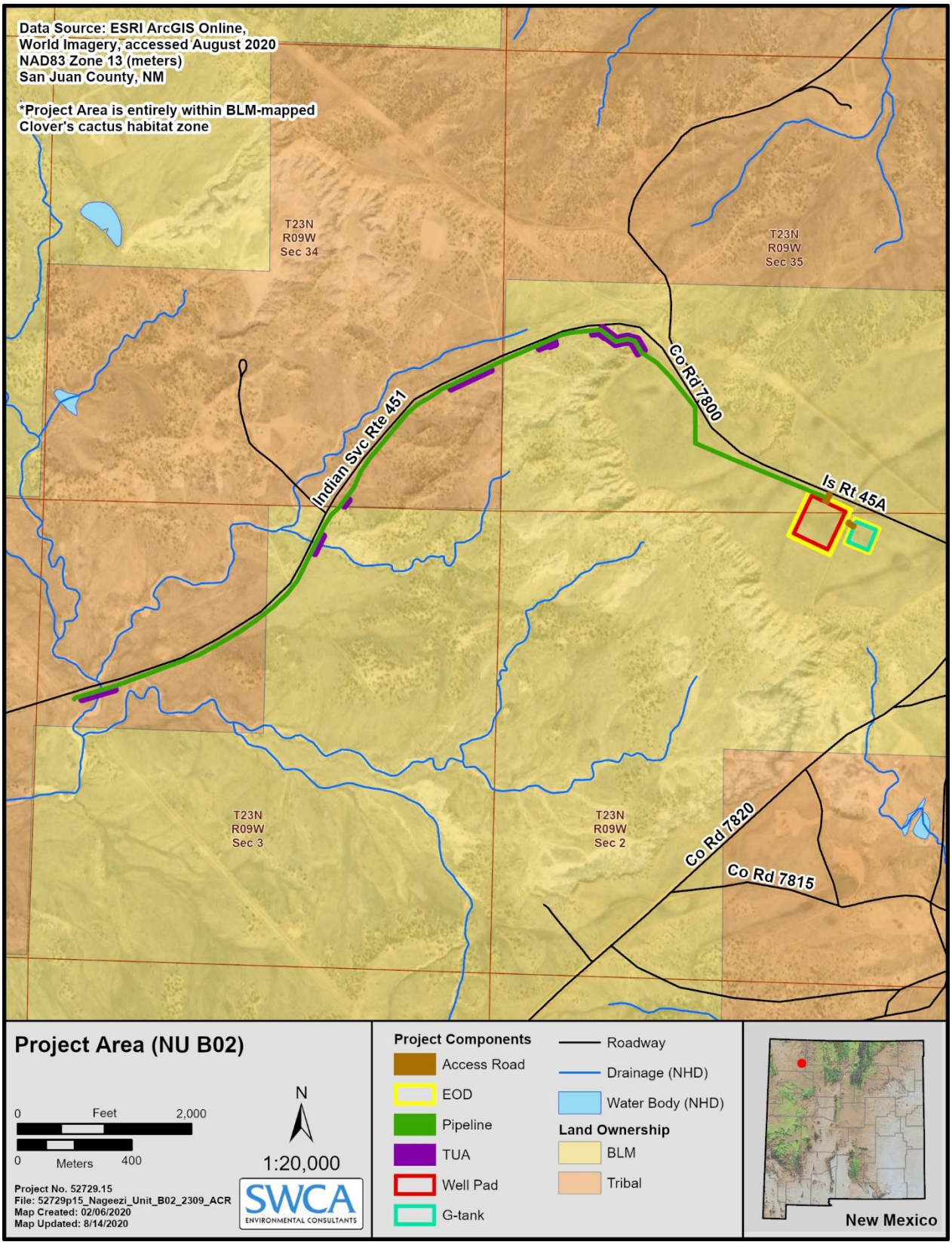
Map E.1. Project vicinity map.



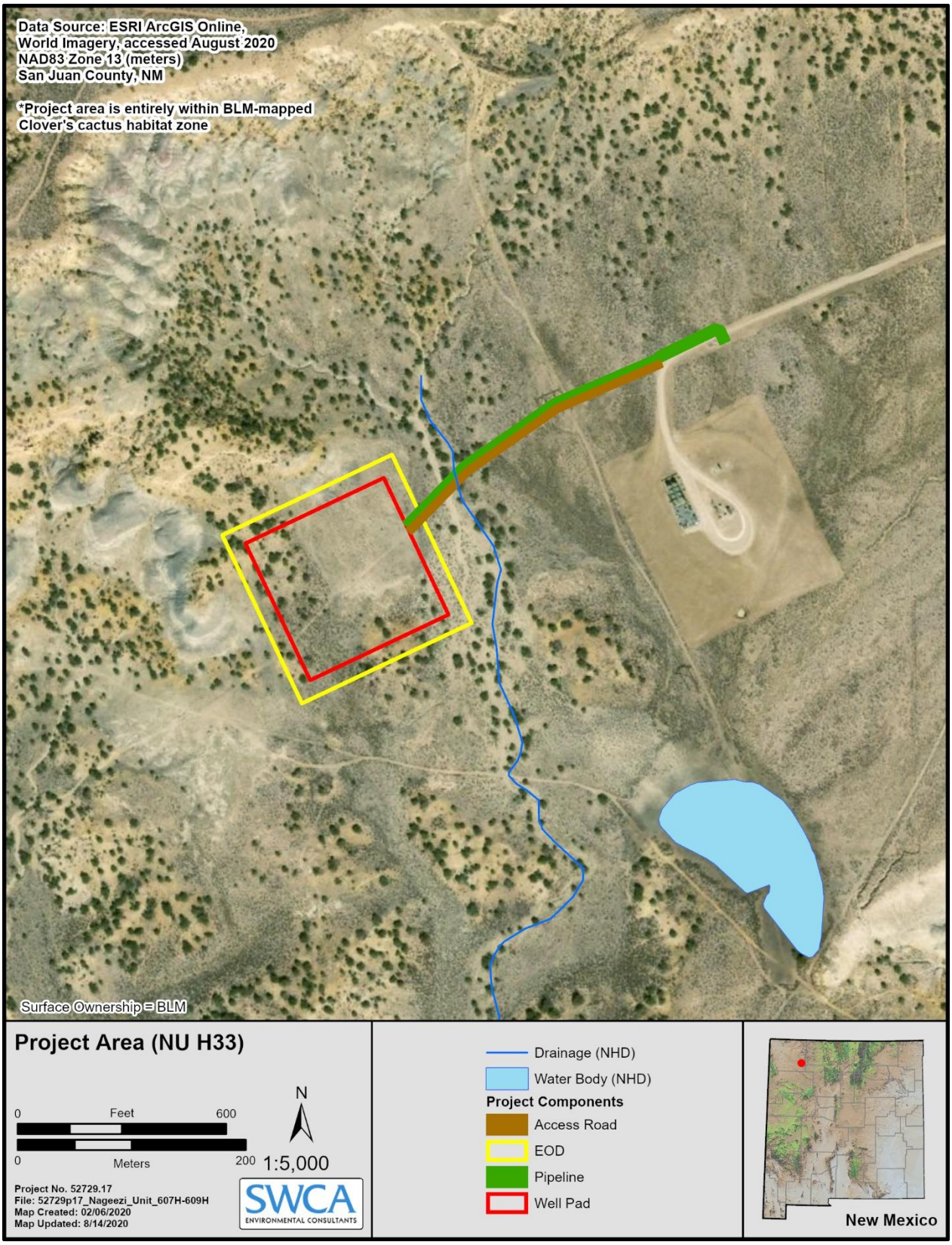
Map E.2. NU M35 project area map.



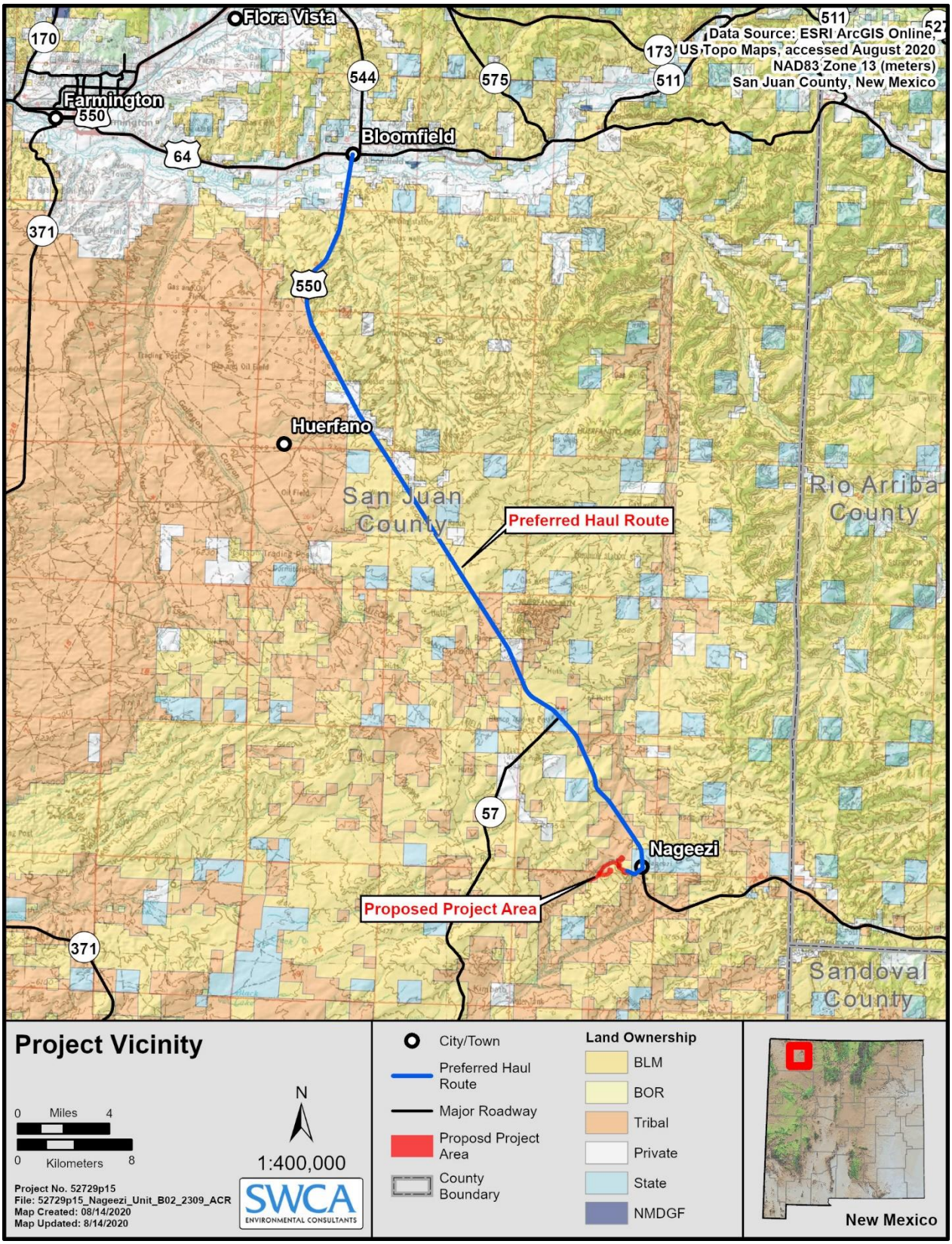
Map E.3. NU G35 project area map.



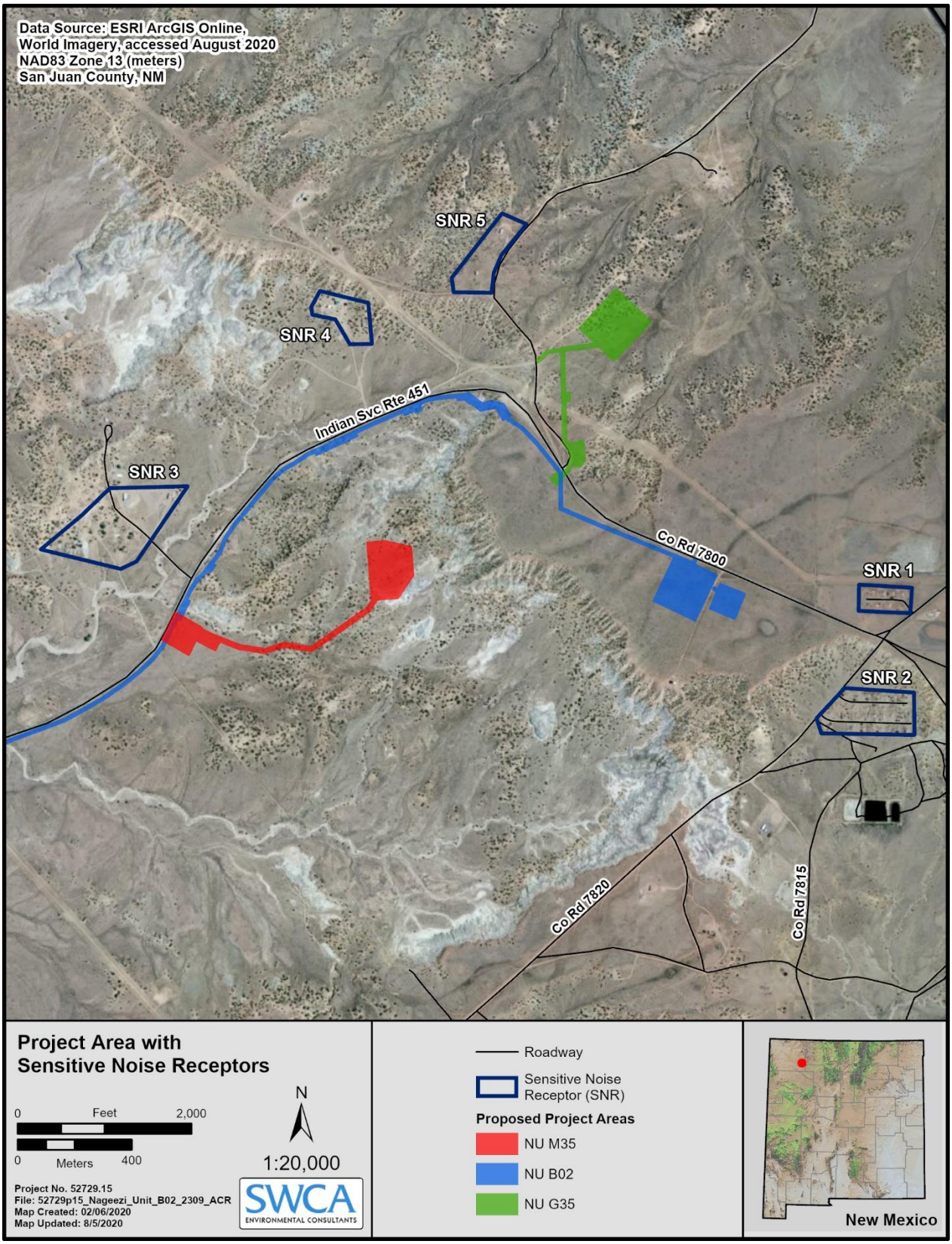
Map E.4. NU B02 project area map.



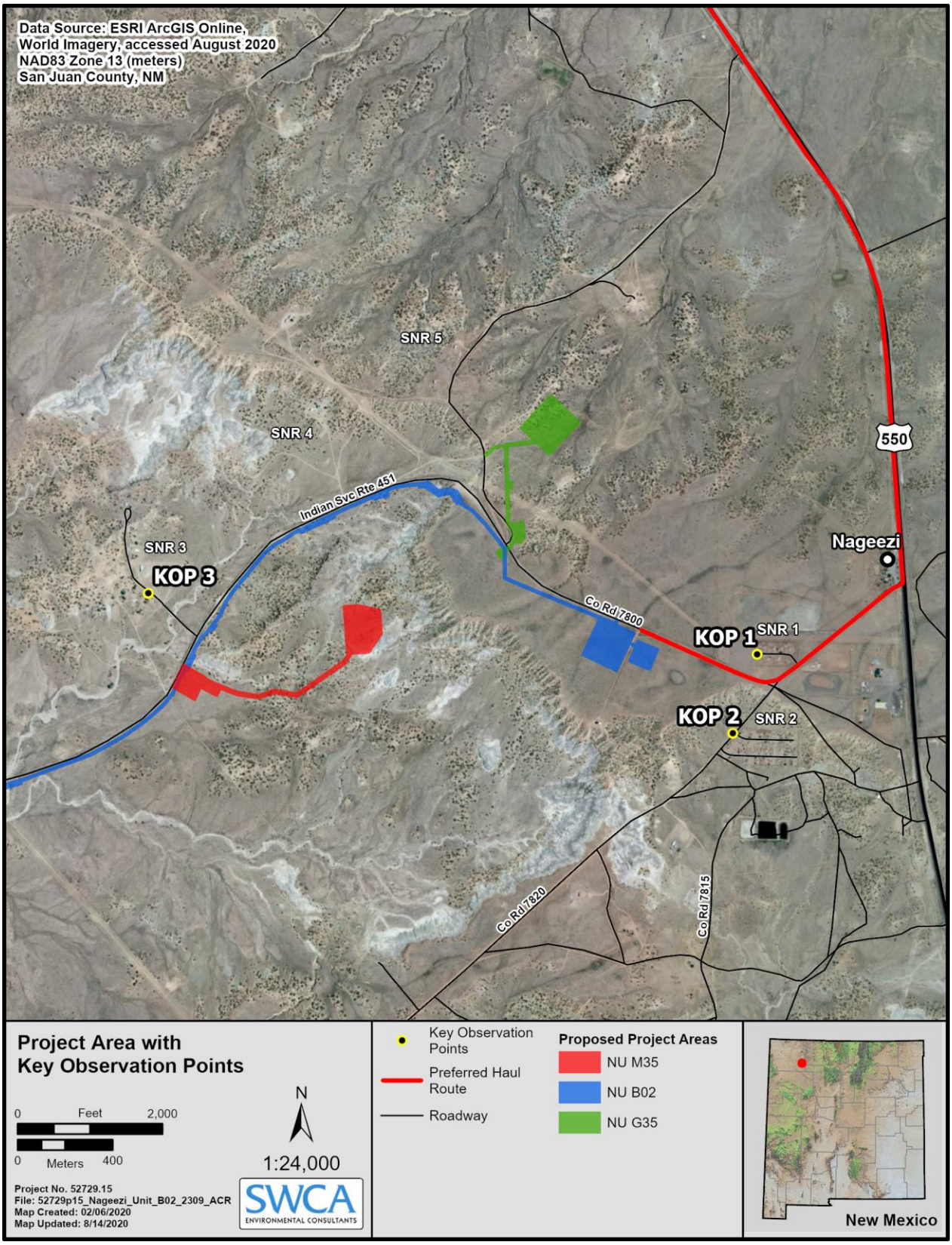
Map E.5. NU H33 project area map.



Map E.6. Construction truck haul route.



Map E.7. Sensitive noise receptors.



Map E.8. Key observation points.

Appendix F: Tables

Table 1.1. Permits, Regulations, and Approvals Relevant to the Proposed Project

Permit/Regulation/Approval	Issuing Agency	Status
Federal Permit, Approval, or Clearance		
APD	BLM	The applications are currently under review by the BLM and are the subject of this EA.
Executive Order (EO) 12898	BLM	Impacts to minority and low-income populations are described in Section 3.8.
Section 7 of the Endangered Species Act	U.S. Fish and Wildlife Service (USFWS)	The proposed project is in conformance with the biological assessment conducted for the RMP (BLM 2002). All fresh water used for pads and road construction and well drilling and completion will be trucked from the Blanco Trading Post Water Well, point of diversion number SJ-2105. No new water depletions are associated with Proposed Action. No further consultation with the USFWS is required.
Federal Noxious Weed Act (Public Law [PL] 93-629; 7 USC 2801 et seq. 88 Statute [Stat.] 2148)	BLM	Natural resource specialists conducted noxious weed surveys within the proposed project areas in July 2018 (NU M35), July 2019 (NU B02), and December 2019 (NU G35 and NU H33). See Table 1.4 for details.
Clean Water Act (CWA) Section 402 General Construction (Stormwater) Permit	U.S. Environmental Protection Agency and New Mexico Environment Department (NMED)	The proposed project is exempt based on the 1987 Water Quality Act and Section 323 of the Energy Policy Act of 2005.
Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703–712)	BLM	The BLM would comply with MBTA pre-construction nesting survey requirements.
Paleontological Resources Preservation Act of 2009 (Sections 6301–6312 of the Omnibus Public Lands Act of 2009, 16 USC 470aaa)	BLM	Table 1.4 describes potential impacts to paleontological resources. Please refer to Table 1.4 for details.
CWA Section 404 Permitting Discharges of Dredge or Fill Material into Waters of the U.S. (including wetlands)	U.S. Army Corps of Engineers	During on-site meetings and natural resources surveys within the proposed project areas, natural resources specialists determined that there would be no impacts to waters of the U.S. Please refer to Table 1.4 for details.
Section 106 of the National Historic Preservation Act	BLM	Table 1.4 describes potential impacts to cultural resources. Any required further consultation with the State Historic Preservation Office would be conducted by the BLM.
State Permit, Approval, or Clearance		
New Mexico EO 00-22 (regarding Noxious Weeds)	New Mexico Department of Agriculture	Natural resources specialists conducted noxious weed surveys within the proposed project areas in July 2018 (NU M35), July 2019 (NU B02), and December 2019 (NU G35 and NU H33). Please refer to Table 1.4 for details.
Clean Air Act New Mexico Air Quality Control Act	NMED	Impacts to air quality are described in Sections 3.1 and 3.2. The Proposed Action would be considered a minor source unit and may be permitted with a General Construction Permit per 20.2.72 New Mexico Administrative Code (NMAC). A notice of intent would need to be filed with NMED.

Table 1.2. Individuals and Groups Invited to the On-site Meeting

Name	Group
Bruce Baizel, Pete Dronkers	Earthworks
Thomas Singer, Erik Schlenker-Goodrich, Kyle Tisdale	Western Environmental Law Center
Mike Eisenfeld	San Juan Citizens Alliance
Samantha Ruscavage-Barz, Jeremy Nichols, Rebecca Sobel	WildEarth Guardians
Anson Wright	Chaco Alliance
Lori Goodman	Diné Care
Don Schrieber	Devil Springs Ranch
Joe Trudeau	Center for Biological Diversity
Miya King-Flaherty	Sierra Club
Tweeti Blancett	Interested Public
Pinu'u Stout	Pueblo of San Felipe
Sonia Grant	University of Chicago/Private Citizen
Daniel Tso	Interested Public
All Pueblo Council of Governors	All Pueblo Council of Governors
Michael Casaus	New Mexico Wilderness Society

Table 1.3. Issues Identified for Detailed Analysis

Issue Number	Issue Statement	Impact Indicator
Issue 1	How would emissions generated by equipment associated with the Proposed Action impact air quality?	Emissions
Issue 2	How would the future potential development of the Proposed Action contribute to greenhouse gas (GHG) emissions?	Emissions
Issue 3	How would future drilling and completion operations associated with the Proposed Action impact groundwater quality and quantity?	Water Volumes Number of Wells
Issue 4	How would vehicle traffic and public road safety be impacted along the proposed haul truck route, which includes the community of Nageezi?	Increased Traffic
Issue 5	How would noise generated during construction activities, including well drilling/completion, pipeline installation and access road construction, from heavy equipment affect nearby residences?	Noise from Construction Activities
Issue 6	How would construction and operation of the facilities associated with the Proposed Action, primarily the B02 and M35 project areas, impact the scenic quality for the Nageezi community?	Visual Impacts from Equipment
Issue 7	How would the development of the Proposed Action impact the quality of life of nearby residents, including the community of Nageezi?	Noise, Visual, Air Quality, Traffic, Water Quality
Issue 8	How would the development of the Proposed Action impact environmental justice communities, primarily the community of Nageezi?	Quality of Life, Traffic, Noise, Visual, Water Quantity and Quality, and Air Quality, including GHGs
Issue 9	How would the Proposed Action, particularly the proposed NU M35 and NU H33 project areas, impact suitable habitat for Clover's cactus?	Impacts to Suitable Habitat for Special Status Plant Species

Table 1.4. Issues Identified but Eliminated from Detailed Analysis

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would proposed ground-disturbing construction, operation, and maintenance activities impact cultural resources?	Impacts to cultural resources from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. There are no Chaco Culture Archaeological Protection Sites or United Nations Educational, Scientific and Cultural Organization World Heritage Sites within or near the proposed project areas. Five Class III Archaeological Surveys (NMCRIS No. 144910; BLM Report No. 2020(II)010F, NMCRIS No. 144909; BLM Report No. 2020(II)011F, NMCRIS No. 144851; BLM Report No. 2020(II)0013F, NMCRIS No. 144852; BLM Report No. 2020(II)012F) were conducted in the proposed project areas. During two of these surveys, no cultural resources were discovered. During the survey for the NU G35 project (2020(II)0013F), two sites were identified. Both of these sites were given a Not Determined eligibility status for listing in the National Register of Historic Places (NRHP), and both sites would have temporary site protection fencing and the presence of an archaeological monitor. During the survey for the NU H33 project (2020(II)012F), two sites were identified, both of which were also given a Not Determined eligibility status for the NRHP. Both of these sites would also have temporary site protection fencing and the presence of an archaeological monitor. A fifth Class III Archaeological Survey was previously conducted for the NU M35 project (NMCRIS No. 141538; BLM Report No. 2019(I)007F). During this inventory, two sites were discovered, one of which were determined to be Eligible for listing in the NRHP, and the other site was given a Not Determined eligibility status. Both sites would have temporary site protection fencing and the presence of an archaeological monitor. These stipulations can be found in the In-House Survey Determination Form NM-210-2020-028. Details of the cultural resources surveys of the proposed project areas, as well as results of Section 106 consultation and government-to-government consultation, are detailed in Chapter 4. Project design features and best management practices (BMPs) (detailed in Appendix H of the EA) would mitigate impacts to cultural resources to the point that detailed analysis is not warranted. The proposed projects would be in compliance with Section 106 of the National Historic Preservation Act (NHPA).
How would proposed ground-disturbing construction, operation, and maintenance activities impact Native American religious concerns or other concerns?	Impacts to traditional cultural properties (TCPs) from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. Results of the cultural resources surveys (which would include surveys for Native American religious concerns) of the proposed project areas, as well as results of NHPA Section 106 consultation and government-to-government consultation, are provided in Chapter 4. There are no known TCPs or sensitive cultural areas present in the proposed project areas. Project design features and BMPs (detailed in Appendix H of the EA) would mitigate impacts to cultural resources to the point that detailed analysis is not warranted. The proposed projects would be in compliance with the American Indian Religious Freedom Act of 1978 and Section 106 of the NHPA.
How would proposed ground-disturbing construction, operation, and maintenance activities impact paleontological resources?	Impacts to paleontological resources from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. SWCA consulted with the BLM FFO regarding the potential for paleontological resource to occur within the proposed project area. The proposed project is not located within any specially designated area for paleontology but is located in an area of known paleontological resources within the Nacimiento Formation (Potential Fossil Yield Classification [PFYC] 5). The BLM conducted spot pedestrian surveys at two locations where potential for paleontological resource occurrence is high: where the pipeline comes off the bluff along CR 7800 and along the south and southeast side of the proposed M35-2409 well pad. Paleontological monitoring will be required during construction at these sites. If any paleontological resources are discovered during activities associated with the proposed project, DJR will inform the BLM Authorized Officer and activities in the vicinity of the discovery would be suspended or adjusted to avoid further impacts. The discovery would be protected from damage or looting. The BLM determined that the project design features and BMPs (detailed in Appendix H of the EA) would mitigate impacts to paleontological resources to the point that detailed analysis is not warranted (BLM 2020c). The proposed project would be in compliance with the Paleontological Resources Preservation Act of 2009.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would proposed project activities impact the socio-economics of the Nageezi community?	BLM: DJR will provide information for the process in which they coordinate with the BLM and FIMO in the development of lease unit division and identify drainage patterns prior to unit finalization and approval. This allows for DJR to work closely with FIMO to determine fair compensation for allottee mineral development and management. This information will be captured with adequate rationale within the Issues Dismissed with Rationale table within the EA
How would proposed project activities impact range improvements and livestock mobility associated with the existing allotment within the proposed project area?	Impacts to rangeland resources, including grazing allotments, from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project areas are located within the 47,698-acre Largo Community Allotment (No. 5083) and the 103,305-acre Kimbeto Community Allotment (No. 6013). The proposed project would disturb 49.6 acres, which is 0.03% of the total allotments' acreage. The proposed project would not directly impact any existing range improvements or long-term trend plots. Project design features (detailed in Appendix H of the EA) would mitigate impacts to range improvements and livestock to the point that detailed analysis is not warranted.
How would vegetation removal during proposed construction activities impact suitable foraging and nesting habitat for migratory birds?	Impacts to wildlife (including migratory birds) from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The BLM FFO manages approximately 435,500 acres within the Great Basin desert scrub plant community (BLM 2003b). The Proposed Action would result in the clearing of 49.6 acres of poor to marginal migratory bird nesting and foraging habitat within sagebrush shrubland (which is part of the Great Basin desert scrub plant community). The total amount of impacts associated with the proposed ground-clearing activities would be less than 0.01% of this community within the BLM FFO. Migratory bird nest surveys will be performed prior to any construction activities (May 15–July 31). Project design features (detailed in Appendix H of the EA) would mitigate impacts to a degree that detailed analysis is not warranted. The proposed project would be in compliance with the MBTA.
How would vegetation removal and increased noise during proposed construction activities impact federally listed threatened, endangered, and candidate species?	Impacts to federally listed species from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. SWCA performed biological surveys of the proposed project areas in July 2018 (NU M35), July 2019 (NU B02), and December 2019 (NU G35 and NU H33). The proposed project areas do not provide optimal habitat for any federally listed species (BLM 2018a, 2018b). Additionally, the Proposed Action would not use any surface water that could affect federally listed threatened, endangered, and candidate species; all fresh water used for pad and road construction and well drilling and completion would be trucked from the Blanco Trading Post Water Well, point of diversion authorization number SJ-2105. There would be no new water depletions associated with Proposed Action. Further detailed analysis is not warranted. The Proposed Action would be in compliance with the ESA and with the PRMP/FEIS and associated biological assessment (BLM 2002). No further consultation with the U.S. Fish and Wildlife Service is required.
How would lighting associated with proposed construction activities impact stargazing potential within the surrounding area?	The proposed project areas are approximately 16.5 miles from Chaco Culture National Historical Park and thus would not impact stargazing from that area. Lighting associated with the proposed project would only occur between the hours of 6:00 a.m. and 6:30 p.m. Project design features (detailed in Appendix H of the EA) would mitigate impacts to stargazing to a degree that detailed analysis is not warranted.
What is the potential for the spread of noxious weeds and invasive plants as a result of the proposed project?	The spread of weeds associated with BLM FFO–wide oil and gas development was analyzed in the PRMP/FEIS (BLM 2003b), as amended. Project design features (detailed in Appendix H of the EA) would mitigate the spread of weeds to the degree that detailed analysis is not warranted. The proposed project would be in compliance with the Federal Noxious Weed Act and New Mexico EO 00-22.
What vegetation impacts would occur as a result of proposed ground-disturbing activities?	Impacts to upland vegetation from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The BLM FFO manages approximately 435,500 acres within the Great Basin desert scrub plant community (BLM 2003b). The proposed projects, which would result in the clearing of 49.6 acres of reclaimed sagebrush shrubland (which is part of the Great Basin desert scrub plant community), would impact less than 0.01% of this community within the BLM FFO. Project design features (detailed in Appendix H of the EA) would mitigate impacts to vegetation to the degree that detailed analysis is not warranted.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would storage and transportation of hydrocarbon liquids impact drinking water sources or surface waters?	The proposed wells would be drilled using a closed-loop system to contain drill cuttings and fluids. The total depth of the proposed well bores would be about 5,990 to 10,515 feet below the ground surface. The producing zone targeted by the Proposed Action is well below any underground sources of drinking water. All chemicals stored on-site would be properly contained. On-site containment structures such as containment dikes, containment walls, and drip pans would be impervious and would be maintained to prevent a discharge to waters of the U.S. BMPs would ensure that no materials are discharged into downstream jurisdictional water features. Project design features (detailed in Appendix H of the EA) would mitigate impacts to drinking water and surface waters to the degree that detailed analysis is not warranted.
What is the potential for impacts to oil and gas/energy production?	Impacts to oil and gas resources from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The commitment of these resources is also analyzed at the lease level. The proposed project would contribute to future mineral development within the NU. Further detailed analysis is not warranted.
What are potential impacts from waste (hazardous materials) associated with ground-disturbing activities?	Project design features (detailed in Appendix H of the EA), as well as the adherence to Onshore Oil and Gas Operations regulations (43 CFR 3160), would mitigate impacts associated with waste to the degree that detailed analysis is not warranted.
How would the construction and operation phases of the proposed project impact recreation and access to BLM land (for uses such as hunting, fishing, shooting, etc.)?	Impacts to recreation from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project areas are not located within a specially designated recreation area. Dispersed recreation opportunities similar in type are readily available across a wide area in and around the Proposed Action. The proposed projects would not restrict recreation opportunities, since recreation is dispersed throughout the area; therefore, detailed analysis is not warranted.
How would activities and facilities associated with the proposed project impact public access to BLM land?	Impacts to land and access from BLM FFO–wide oil and gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. While public access roads and rights-of-way (ROWs) are present in the immediate area and would be used by personnel during all phases of the proposed projects, access to the public would not be restricted (other than the usage of potential, temporary flaggers, or other safety features). The presence of the proposed well pads would likewise not impact public use in the areas. Additionally, the use of mitigation measures will minimize the impacts and protect the existing ROWs. With standard design features and stipulations, no further analysis is needed.

Table 2.1. Proposed Action Surface Disturbance

Project Feature	Surface Disturbance (acres)		Interim Reclamation (acres)		Final Reclamation (acres)	
	BLM FFO	Navajo Allotted	BLM FFO	Navajo Allotted	BLM FFO	Navajo Allotted
NU M35						
Access road	1.9	-	-	-	1.9	-
Well pad and construction zone	6.8	-	4.6	-	2.2	-
Pipeline	1.0	-	1.0	-	-	-
G-tank pad	2.8	-	2.8	-	-	-
Staging area	0.6	-	0.6	-	-	-
Total	***13.1***	***0***	***9.0***	***0***	***4.1***	***0***
	13.1		***9.0***		***4.1***	
NU G35						
Access road	0.2	0.4	-	-	0.2	0.4

Project Feature	Surface Disturbance (acres)		Interim Reclamation (acres)		Final Reclamation (acres)	
	BLM FFO	Navajo Allotted	BLM FFO	Navajo Allotted	BLM FFO	Navajo Allotted
Well pad and construction zone	0.2	7.6	0.2	5.4	-	2.2
Pipeline	1.1	0.3	1.1	0.3	-	-
2 TUAs	0.3	-	0.3	-	-	-
Total	***1.8***	***8.3***	***1.6***	***5.7***	***0.2***	***2.6***
	10.1		***7.3***		***2.8***	
NU B02						
Well pad access road	<0.1	-	-	-	<0.1	-
Well pad and construction zone	7.1	-	4.9	-	2.2	-
Pipeline	2.9	2.3	2.9	2.3	-	-
G-tank pad and access road	1.9	-	1.9	-	-	-
Staging area	2.4	-	2.4	-	-	-
6 TUAs	1.3	0.7	1.3	0.7	-	-
Total	***15.7***	***3.0***	***13.4***	***3.0***	***2.3***	***0***
	18.7		***16.4***		***2.3***	
NU H33						
Access road	0.6	-	-	-	0.6	-
Well pad and construction zone	6.6	-	4.4	-	2.2	-
Pipeline	0.5	-	0.5	-	-	-
Total	***7.7***	***0***	***4.9***	***0***	***2.8***	***0***
	7.7		***4.9***		***2.8***	
Proposed Action Total	***38.3***	***11.3***	***28.9***	***8.7***	***9.4***	***2.6***
	49.6		***37.6***		***12.0***	

Table 3.1. Design Values for Counties within the Analysis Area

Pollutant	2019 Design Concentrations	Averaging Time	NAAQS	NMAAQS [a,b]
O_3	Rio Arriba County: 0.067 ppm Sandoval County: 0.068 ppm San Juan County: 0.070 ppm: three stations; Bloomfield at 0.069 ppm, Navajo Dam at 0.070 ppm, Shiprock at 0.069 ppm	8-hour	0.070 ppm [a]	–
NO_2	San Juan County: three stations; Bloomfield at 10 ppb, Navajo Dam at 6 ppb, Shiprock at 3 ppb	Annual	53 ppb [b]	50 ppb
NO_2	San Juan County: Bloomfield at 34 ppb	1-hour	100 ppb [c]	–
SO_2	San Juan County: 2 ppb	1-hour	75 ppb [c]	–
PM_{10}	San Juan County: Invalid monitor data [e]	24-hour	150 µg/m^3 [d]	–

Source: EPA (2020a)

ppm = parts per million, ppb = parts per billion, µg/m^3 = micrograms per cubic meter

[a] Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years.

[b] Annual mean.

[c] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

[d] Not to be exceeded more than once per year on average over 3 years.

[e] PM_{10} monitor stations currently show installed locations in the planning area (San Juan County); however, the monitor status of these stations show invalid data and cannot be used to represent design values.

[f] The NMAAQS standard for total suspended particulates, which was used as a comparison with PM_{10} and $PM_{2.5}$, was repealed as of November 30, 2018.

[g] While there are no NAAQS for hydrogen sulfide (H_2S), New Mexico has set a 1-hour standard for H_2S at 0.010 ppm for all areas of the state outside of the area within 5 miles of the Pecos-Permian Air Quality Control Region (BLM 2020b).

Table 3.2. Human-Caused Emissions in the New Mexico Portion of the San Juan Basin, in Tons per Year

Emissions	NO_X	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2
2014 NEI—all sources	70,254	166,934	93,762	118,725	18,898	6,603
2014 NEI—petroleum and related industries	25,011	–	66,385	–	–	–
WESTAR-WRAP 2014 oil and gas sources	44,433	–	86,173	–	–	–

Sources: EPA (2014a); Ramboll Environ (2017). Includes data for San Juan, Sandoval, Rio Arriba, and McKinley Counties.

Notes: Values include Tier 1 summaries for each county, including combustion, industrial, on-road/non-road, and miscellaneous sectors. Biogenic sources are not included.

Only precursor pollutants to O_3 formation are compared in this analysis (NO_x and VOCs).

Table 3.3. AQI Summary Data for Number of Days Classified above 100 for the Analysis Area (2008–2018)

County	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
San Juan	3	0	20[b]	18	12	6[c]	0	2	2	6	16
Sandoval	0	0	0	0	0	0	0	0	0	1	12
Rio Arriba	0	0	0	0	0	2	0	0	0	3	3
McKinley	0	0	0	0	0	0	–	–	–	–	–

Source: EPA (2019b)

Note: All AQI values presented are classified as unhealthy for sensitive groups (101–150), unless otherwise indicated. Annual summary data for McKinley County are only available for 2008–2013.

[a] Including 1 unhealthy day (above 150).

[b] Including 5 unhealthy days (above 150) and 2 very unhealthy days (above 200).

[c] Including 1 unhealthy day (above 150).

Table 3.4. Annual Emissions from Operation of the Well Pad and Wells

	Emissions (tons per year)					
Emissions	NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$
Current human-caused emissions (San Juan, Sandoval, Rio Arriba, and McKinley Counties)	70,255	6,603	166,934	93,762	118,725	18,898
Emissions from Nageezi Units 2309 and 2409 Cluster oil wells [a]	69.87	0.08	125.23	292.90	3.27	3.07
Increase	0.099%	0.001%	0.075%	0.312%	0.003%	0.016%

[a] DJR (2020). See Appendix I for more details.

Table 3.5. Cumulative Air Emissions from Oil and Gas Development

	Emissions (tons per year)					
	NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$
Current human-caused emissions (New Mexico portion of San Juan Basin)	70,255	6,603	166,934	93,762	118,725	18,898
Total annual emissions from the RFD (160 wells/year) [a]	961.60	17.60	408.00	2,456	849.60	131.20
Construction and operations of the Nageezi Units 2309 and 2409 Cluster oil wells [b]	69.87	0.08	125.23	292.90	3.27	3.07
Total	1,031.47	17.68	533.23	2,748.60	852.87	134.27
Increase	1.468%	0.268%	0.319%	2.931%	0.718%	0.710%
Contribution of Proposed Action to total annual cumulative impact	6.773%	0.452%	23.485%	10.645%	0.383%	2.286%

[a] The representative well used to calculate emissions is a horizontal oil well. Emissions for vertical wells were not used from this analysis due to current predominance in horizontal technological drilling methods and because presenting horizontal oil wells emissions estimates represents a more conservative summary of emissions, compared with emissions from a vertical well, with the exception of SO_2, which could be four to five times greater in a vertical well scenario. However, SO_2 emissions are still estimated to be within the same magnitude and less than 1 ton per year of SO_2 emissions per well. Because oil wells are the predominant type of well in the FFO area, this analysis assumes that all the developed wells will be oil wells. Gas well emission factors are shown as well for comparison. See Appendix G for additional discussion of emission factors.

[b] DJR (2020a). See Appendix I for more details.

Table 3.6. 2016 Estimated Annual GHG Emissions from Oil and Gas Field Production (Operations)

Annual GHG Emissions	CO_2e (metric tons/year)	U.S. Emissions (%)	New Mexico Oil and Gas Emissions (%)
Total U.S GHG emissions from all sources	6,511,300,000	100	NA
Total U.S. GHG emissions from oil and gas field production	164,400,000	2.52	NA
Total New Mexico emissions from oil and gas field production	6,794,108	0.10	100.00
Total oil and gas emissions from federal production in New Mexico	3,955,124	0.06	58.21
Federal emissions in San Juan Basin from oil and gas field production (16,139 wells) *	1,678,942	0.03	24.71

* Includes federal mineral development in McKinley, Rio Arriba, Sandoval, and San Juan Counties (BLM 2020b).

Source: BLM (2020e).

Table 3.7. Historical Oil and Gas Production (Downstream/End Use)

Oil and Gas Production	2014	2015	2016	2017	2018
U.S. oil production (Mbbl)	3,196,889	3,442,188	3,232,025	3,413,376	4,011,521
New Mexico oil production (Mbbl)	125,021	147,663	146,389	171,440	248,958
PDO oil production (Mbbl)	62,007	73,344	74,810	76,307	122,032
BLM Mancos Gallup planning area oil production (Mbbl)	5,755	8,457	6,889	5,980	5,089
U.S. gas production (MMcf)	25,889,605	27,065,460	26,592,115	27,291,222	30,438,588
New Mexico gas production (MMcf)	1,140,626	1,151,493	1,139,826	1,196,514	*
BLM Mancos Gallup planning area gas production (MMcf)	245,550	281,713	287,347	293,094	476,405

Oil and Gas Production	2014	2015	2016	2017	2018
FFO gas production (MMcf)	664,211	642,211	596,747	464,709	437,926
GHG Emissions					
Total U.S. oil and gas GHG emissions (MMT CO2e)	2,791.29	2,961.11	2,844.84	2,961.08	-
Total New Mexico oil and gas GHG emissions (MMT CO2e)	116.17	126.50	125.32	139.19	-
Total PDO oil and gas GHG emissions (MMT CO2e)	40.10	46.95	47.89	48.85	-
Total BLM Mancos Gallup planning area oil and gas GHG emissions (MMT CO2e)	38.82	38.78	35.62	28.00	-

Source: BLM (2019a).

Mbbl = thousand barrels of oil

PDO = Pecos District Office

*=Data total for PDO, FFO includes data from both federal and mixed exploratory land classes.

– = Data not available for 2018 (BLM 2020b).

Table 3.8. Estimated Annual GHG Emissions from Development and Production of the Proposed Action

Annual GHG Emissions	CO_2e (metric tons)	All U.S. Annual Emissions (%)	Annual New Mexico Oil and Gas Production Emissions
Well Development (16 oil wells, Year 1 only)	8,405	0.00013	0.008
Well Field Production (Operations) (16 wells)	5,196	0.00008	0.005
Total	**13,601**	**0.00021**	**0.013**

Table 3.9. Estimated Downstream/End Use (Indirect) GHG Emissions for the Proposed Action

Proposed Action Product	Emission Factors	Estimated Product Quantity	Estimated Emissions (million metric tons CO_2e)
Crude Oil (bbl)	0.43 metric ton CO_2/bbl	2,190,000	941,700
Natural Gas (mcf)	0.055 metric ton CO_2/mcf	8,760,000	481,800
Total		**–**	1,423,500

Source EPA (2020e)

Table 3.10. Reasonably Foreseeable Coal, Oil, and Gas Production and Consumption GHG Emissions, BLM New Mexico, Oklahoma, Kansas, and Texas

GHG Emissions (MMT CO_2e per year)					
Category	**New Mexico**	**Oklahoma**	**Kansas**	**Texas**	**NM, OK, KS, TX**
2020 High Scenario					
Federal coal	13.89	1.25	0	0	15.14
Federal oil	25.49	0.33	0.08	0.06	25.95
Federal gas	49.60	0.96	0.29	2.40	53.25
Federal natural gas liquids	6.11	0.09	0.05	0.04	6.29

GHG Emissions (MMT CO_2e per year)					
Category	**New Mexico**	**Oklahoma**	**Kansas**	**Texas**	**NM, OK, KS, TX**
Total Federal	**95.09**	**2.63**	**0.42**	**2.50**	**100.64**
Federal + non-federal coal	43.12	1.87	0.13	97.46	142.58
Federal + non-federal oil	55.28	56.72	22.10	518.06	652.16
Federal + non-federal gas	83.28	152.16	18.14	694.29	947.87
Federal + non-federal natural gas liquids	12.14	20.09	3.14	84.14	119.51
Total federal and non-federal	**193.82**	**230.84**	**43.51**	**1,393.95**	**1,862.12**
2030 High Scenario					
Federal coal	10.14	0.91	0	0	11.05
Federal oil	25.60	0.33	0.08	0.06	26.07
Federal gas	57.44	1.11	0.34	2.78	61.67
Federal natural gas liquids	6.17	0.09	0.05	0.04	6.35
Total Federal	**99.35**	**2.44**	**0.47**	**2.88**	**105.14**
Federal + non-federal coal	31.52	1.37	0.1	71.12	104.11
Federal + non-federal oil	55.51	56.95	22.19	520.20	654.85
Federal + non-federal gas	96.45	176.21	21.02	804.05	1,097.72
Federal + non-federal natural gas liquids	12.25	20.27	3.17	84.88	120.57
Total federal and non-federal	**195.73**	**254.8**	**46.47**	**1,480.25**	**1,977.25**

Note: Totals may not sum exactly due to rounding.

Source: Golder Associates (2017).

Table 3.11. Projected Changes in Climate under Representative Concentration Pathways

RCP Pathway	Near Term		Far Term	
	Temperature (°C)	Precipitation (%)	Temperature (°C)	Precipitation (%)
RCP 2.6	0.78	1.44	0.97	2.27
RCP 4.5	0.85	1.49	1.81	3.51
RCP 8.5	0.98	1.62	3.68	5.89

Table 3.12. Annual Average Daily Traffic and Crash Data for Proposed Route

Route	Distance (miles)	2018 AADT Trend	Number of Accidents	Type of Road
U.S. 550	36.0	13,316	58	four-lane paved state highway
San Juan CR 7800	0.8	N/A	N/A	two-lane paved roadway
Total	**36.8**	**13,316 average AADT**	**58**	-

N/A = Data is not available

Table 3.13. 2018 AADT Trend, AADT Truck Trend and Associated Accidents for Proposed Route

Route	2018 AADT Trend	2018 AADT Truck Trend	Vehicles Accidents (Other Than Trucks)	Truck Accidents
U.S. 550	13,316	2,025	53	5
CR 7800	N/A	N/A	N/A	N/A
Total	**13,316**	**2,025**	**53**	**5**

N/A – Data is not available

Table 3.14. Total Average Daily Round Trips for All Construction Vehicles Per Proposed Project Area

Project Construction Phase	Duration (Days)	Total Number of Round Trips (Heavy Vehicles)	Total Number of Round Trips (Light Vehicles)	Average Daily Round Trips (Heavy Vehicles)	Average Daily Round Trips (Light Vehicles)	Total Average Daily Round Trips (All Vehicles)
Construction	12	4	24	0.25	2.00	2
Drilling	12	203	151	16.92	12.58	30
Completions	10	97	171	9.70	17.10	27
Flow testing	15	407	82	27.13	5.47	33
Pipeline connect	12	24	156	2.00	13.00	15
Reclamation	30	41	216	N/A	N/A	9

Source: Construction duration and total number of round trips provided by DJR (DJR 2020c).

Heavy vehicles are considered greater than 26,001 pounds of gross vehicle weight. Light vehicles are less than 19,501 pounds of gross vehicle weight.

N/A – Data is not available.

Table 3.15. Average Daily Well Pad Visits by DJR Operational Staff

Month	Total Vehicle Visits per 30 Days	Daily Vehicle Visit
First month	73	2.4
Second month	63	2.1
Third month	48	1.6
Fourth month	39	1.3
Fifth month	34	1.1
Sixth month	30	1.0

Table 3.16. Example of Sound Sources and Typical Sound Levels

Descriptions of Sound Source	Sound Level (dBA)
Threshold of pain Airplane taking off	140
Chainsaw Ambulance siren	120
Car horn Rotary saw Leaf blower	110

Descriptions of Sound Source	Sound Level (dBA)
Gas lawn mower	100
Garbage disposal Large truck	90
Noisy urban area during the day Doorbell	80
Freeway traffic Vacuum cleaner	70
Normal speech	67
Clothes dryer Washing machine	60
Refrigerator Background noise in a busy office Wooded suburban residential area (Ldn)	50
Urban nighttime Rural residential area (Ldn)	40
Quiet bedroom at night	30
Threshold of hearing	0

Note: Ldn is a measure of outdoor day/night sound levels, averaged over a 24-hour period

Source: Adapted from Center for Hearing and Communication (2020) and EPA (1978)

Table 3.17. Example of Sound Sources and Typical Sound Levels from Oil and Gas Activities

Descriptions of Sound Source	Sound Level (dBA) at 500 Feet from Source
Well completion rig	75
Typical construction site	65
Drilling rig	59 (dB; unweighted)
Heavy equipment (when operating)	68
Compressor station	69
Pumpjack	62
Compressor station with soundwall	46

Source: Adapted from Common Ground Community Trust (2017), BLM (2000), and DJR (2020c).

Table 3.18. Summary of Predicted Noise from Construction Activities by Distance

Approximate Distance in Feet (Miles) from Construction Activity	Approximate Noise Level (dBA) Emanating from Construction
500 (0.09)	65
700 (0.13)	62
900 (0.17)	60
2,400 (0.45)	51
7,920 (1.50)	41

Table 3.19. Summary of Predicted Noise from Well Completion Activities by Distance

Approximate Distance in Feet (Miles) from Well Completion Activity	Approximate Noise Level (dBA) Emanating from Well Completion
500 (0.09)	75
1,100 (0.21)	68
1,700 (0.32)	64
2,400 (0.45)	61
7,920 (1.50)	51

Table 3.20. Summary of Predicted Noise from B02 and G35 Operations Activities by Distance

Approximate Distance in Feet (Miles) from Compressor Station with Soundwall	Approximate Noise Level (dBA) Emanating from Operation
120 (0.02)	58
240 (0.04)	52
480 (0.09)	46
960 (0.18)	40
1,100 (0.21)	39
1,700 (0.32)	35

Table 3.21. Summary of Impacts to KOP Viewsheds

KOP	Time Frame	Feature -Element	Degree of Contrast	Conformance to VRM Class IV Objectives
Residential community off CR 7800 (KOP 1, proximal to seven residences)	1-year	Land - form, line, color, texture	Weak	Yes
		Vegetation - form, line, color, texture	Weak	
		Structures - form, line, color, texture	Moderate	
Residential community off CR 7820 (KOP 2, proximal to 33 residences)	1-year	Land - form, line, color, texture	None	Yes
		Vegetation - form, line, color, texture	None	
		Structures - form, line, color, texture	None	
Residential community south of CR 7800 (KOP 3, proximal to 13 residences)	1-year	Land - form, line, color, texture	Weak	Yes
		Vegetation - form, line, color, texture	Weak	
		Structures - form, line, color, texture	Weak	

Table 3.22. Potential Impact of the Proposed Action to Quality of Life Values

Quality of Life Value	Potential Impact to Quality of Life
Air Emissions	Localized temporary impacts from construction, particularly dust, lasting an average of 3 to 4 months per proposed project. Quality of life may be temporarily affected by presence of

	increased dust or other emissions during construction dependent on the proximity of residences to future potential development as well as atmospheric conditions such as wind speed and direction. Emissions would be minimized through application of air resource protection design features (see Appendix H - Design Features). As such, construction associated with the Proposed Action is unlikely to contribute to a violation of air quality regulations. In addition, the Proposed Action would result in annual increased criteria pollutant emissions from the exhaust emissions from equipment, compressor engines, generators, and flares; and VOCs resulting from oil storage activities (see Table 3.4 in Section 3.1.3). The emissions from the operation of well pads and wells would result in a 0.099% increase in NO_x, 0.001% increase in SO_2, 0.075% increase in CO, 0.312% increase in VOCs, 0.003% increase in PM_{10}, and 0.016% increase in $PM_{2.5}$. The majority of operational emissions associated with the proposed project would be minimized through design features provided in Appendix H.
Groundwater Quantity and Quality	Total potential groundwater use would comprise less than 0.005% of the 2015 San Juan Basin total water use and 0.039% of 2015 San Juan Basin total groundwater use. Drilling fluids would be recycled and transferred to other permitted closed-loop systems or returned to the vendor for reuse until DJR's gathering systems are in place and eventually will be transported via pipeline to the liquids facilities. Residual and flowback water would be recycled or disposed of at a waste disposal facility Any spills of non-freshwater fluids would be immediately cleaned up and removed to an approved disposal site. DJR will also notify the BLM within 24 hours of any reportable spill. Should a spill occur, the BLM would work with the NMOCD to immediately remediate spills on BLM land in accordance with federal and state standards, including 19.15.29.11 NMAC. (see Section 3.3.3). See also the associated SUPOs on file with the BLM FFO for more information regarding DJR's closed loop systems. There have not been any documented past instances of groundwater contamination in the analysis area attributed to well drilling (BLM 2019a). Due to DJR's adherence to the NMOCD's casing, cementing, and pressure-testing requirements to prevent contamination of aquifers, it is anticipated that the proposed wells would not impact water quality. Should a spill occur, the BLM would work with the NMOCD to immediately remediate spills on BLM land in accordance with federal and state standards, including NMAC 19.15.29.11.
Traffic Safety	The Proposed Action would result in an increase of truck traffic on the U.S. 550 corridor and San Juan CR 7800. During construction, there would be approximately two to 33 roundtrips for heavy and light vehicles during the construction of the proposed projects. This would result in a negligible increase of vehicles on the U.S. 550 corridor and San Juan CR 7800.
Noise	The current noise levels in the residential areas are assumed to be a mean value of 40 dBA Ldn. During most construction phases, the proposed projects are expected to temporarily increase daytime noise levels; however, the drilling and completion phases would potentially generate noise 24 hours per day until that phase is complete. The construction noise levels heard by the five identified noise receptors would increase from 40 dBA to a range of 55 to 68 dBA depending on the location of the noise receptor. In combination with ambient noise levels, the noise levels are expected to drop to approximately 43 dBA during the operations phase of the Proposed Action. Additional details on noise impacts are located in Section 3.5.
Scenic Quality	Visual impacts from the Proposed Action would include moderate to weak contrast to undeveloped landscapes from well pads and associated infrastructure, and the removal of vegetation. The proposed projects would meet VRM Class IV objectives while in operation, which would partially retain the existing character of the undeveloped landscape and would not dominate the view of the casual observer.
Light Pollution	Light-emitting sources associated with the construction phase of the proposed projects include lights around the working area, lights on the drilling rig (which may include lights on the derrick), vehicle traffic, and flaring. These light sources would be temporary in nature and sporadically used. Night lighting would only be used during the 24-hour construction days during well completion, would last one to two weeks per well, and would be shielded or turned to the ground whenever possible. Flaring at night would be limited to only days and times necessary for project completion. The necessity and duration for flaring varies from well to well and is difficult to predict. During operations, lighting would be limited to only that needed to conduct work safely.

Table 3.23. Population, Percent Minority, Percent Native American, Income Levels, and Poverty Data for Areas near the Proposed Project, including the Nageezi Navajo Chapter, Towns, San Juan County, and the State of New Mexico

Location	Population	Minority (%)	Native American (%)	Per Capita Income ($)	Median Household Income ($)	Poverty Rate Per Capita Income (%)
Nageezi	261	100	94	5,740	15,375	78
Nageezi Chapter	973	100	98	9,814	21,313	48
San Juan County	125,043	62	39	22,067	44,841	24
New Mexico	2,081,015	62	9	22,146	46,748	20

Source: U.S. Census Bureau (2018).

Table 3.24. Summary of Conclusions from Issues Analyzed in Detail

Issue Analyzed in Detail	Summary of Impacts	Are potential impacts disproportionate to EJ populations?
Issue 1: Air Quality	An overall 0.112% increase in NAAQS and VOC emissions as a result of the Proposed Action; localized temporary impacts from construction, particularly dust, lasting an average of 3 to 4 months per proposed project.	Yes. Short-term fugitive dust ($PM_{2.5}$ or PM_{10}) during construction may be felt more by the residents in close proximity to future potential development. These residents are considered to be EJ populations. The design features provided in Appendix H and project-specific COAs would help to minimize potential effects that could be adverse and disproportionate. Air quality is a regional resource; thus, any adverse impacts to NAAQS would not be disproportionate to EJ populations in the region.
Issue 2: Greenhouse Gas and Climate Change	All GHG emissions would contribute to global GHG emissions. The Proposed Action is estimated to result 13,601 MMT CO_2e from construction and operation and 1,423,500 MMT CO_2e from downstream GHG emissions. GHG emissions are associated with documented ongoing and reasonably foreseeable climate-related effects that may affect quality of life. For the San Juan Basin (southern Colorado to central southern New Mexico), these may include increased temperatures, decreases in overall water availability, and increases in frequency, intensity, and duration of both droughts and floods (BLM 2018b). However, the incremental contribution to global GHGs from the Proposed Action cannot be translated into any specific impact on climate change globally or regionally.	No. Any increase in GHG emissions that could impact climate change as described in the analysis would be regional or global in nature and would not be disproportionately borne by EJ populations in the region.
Issue 3: Water Quantity and Quality	6.44 AF per proposed well are anticipated for use in potential future development. The estimated water use would comprise less than 0.005% of the 2015 San Juan Basin total water use, 0.039% of 2015 San Juan Basin total groundwater use, and would result in a 0.016% increase over 2015 water use in the mining category for the San Juan Basin. With consideration of design features and regulatory requirements, no impacts to groundwater or surface water quality is expected from well drilling and completion. Spills could occur that could affect groundwater or surface waters.	Yes. While groundwater resources are regional in nature and water withdrawal is not anticipated to affect domestic water sources, any potential impacts on local water wells (for example, a spill that affects groundwater) could force residents to find other means of supplying water for domestic use. These residents are EJ populations. Design features and COAs would help to minimize this risk. Should a spill occur, the BLM would work with the NMOCD and/or the Navajo Nation Environmental Protection Agency to immediately remediate spills in accordance with federal and state standards,

		including 19.15.29.11 NMAC and the Navajo Nation Clean Water Act 104(a)(2)(C), 4 Navajo Nation Code 1304(A)(2)(c) (Navajo Nation 2014).
Issue 4: Traffic and Safety	Approximately 116 roundtrips for heavy and light vehicles on the U.S. 550 corridor and San Juan CR 7820 during construction of the proposed project. This would result in a negligible increase along the U.S. 550 corridor and San Juan CR 7800.	Yes. Any impacts associated with truck traffic and safety on U.S. 550 would be regional in nature and impacts would not be disproportionate to EJ populations in the region. However, the increase in truck traffic on San Juan CR 7800 would be localized to the access roads utilized by the Nageezi community. Therefore, there is the potential for the Proposed Action to disproportionately impact traffic congestion and risk of incident, for EJ populations along San Juan CR 7800. The design features provided in Appendix H and project-specific COAs would help to minimize potential effects that could be adverse.
Issue 5: Noise	The Proposed Action would increase noise from 40 dBA to a range of 55 to 68 dBA depending on the location of the residence in relation to the proposed projects. During most construction phases, the proposed projects are expected to temporarily increase daytime noise levels; however, the drilling and completion phases would potentially generate noise 24 hours per day until that phase is complete. Noise levels are expected to drop to approximately 43 dBA during the operations phase of the Proposed Action.	Yes. Any impacts associated with noise would be greater for the residents in close proximity to the proposed projects. These residents are an EJ population. Design features outlined in Appendix H and project-specific COAs would be applied to reduce effects that could be adverse and disproportionate to EJ populations.
Issue 6: Scenic Quality	Visual impacts from the proposed projects well pads would present moderate to weak visual contrast and would be noticeable and distinct from the residential areas in proximity to the proposed project areas.	Yes. Visual impacts associated with construction and operation of the proposed projects would create visual impacts that are greater for the residents that are within the viewshed of the project area. These residents are considered an EJ population. Design features outlined in Appendix H and project-specific COAs would be applied to reduce effects that could be adverse and disproportionate to the EJ population.
Issue 7: Quality of Life	Potential for localized air, noise, visual resources, and traffic and safety impacts that could affect quality of life, particularly during construction. Continued expansion of the oil and gas industry may be perceived as having a negative effect on quality of life for people who value undeveloped landscapes.	Yes. In general, quality of life values could be impacted during construction and operation and would be greater for the residents in close proximity to the proposed projects. These residents are an EJ population. Design features outlined in Appendix H and project-specific COAs would be applied to reduce effects that could be adverse and disproportionate to the EJ population.
Issue 9 Special-Status Plant Species	There is no suitable habitat present for Clover's cactus (*Sclerocactus cloverae*) within or adjacent to the NU G35 and NU B02 project areas. In addition, there is marginal habitat for this species within and adjacent to the NU H33 and suitable/occupied habitat within the NU M35 project area. The Proposed Action would remove approximately 49.5 acres of marginal to suitable/occupied Clover's cactus habitat. This would total a habitat loss of less than 0.0001% of the total available habitat.	No. Any loss of marginal to suitable/occupied Clover's cactus habitat would not be adverse or disproportionate to the EJ population.

Table 4.1 Pueblos and Tribes Who Received Consultation Requests from the BLM FFO

Tribe	Name
All Pueblos Council of Governors	Governors
Eight Northern Indian Pueblos Council	Governors
Five Sandoval Indian Pueblos	Governors
Jicarilla Apache Tribal Council	President Darrell Paiz
Kewa Pueblo (Pueblo of Santo Domingo)	Governor Thomas Moquino, Jr
Nageezi Chapter House	President Ervin Chavez
Navajo Nation	President Jonathan Nez
Ohkay Owingeh	Governor Ron Lovato
Pueblo of Acoma	Governor Brian Vallo
Pueblo of Cochiti	Governor Charles Naranjo
Pueblo of Isleta	Governor Max Zuni
Pueblo of Isleta, Tribal Historic Preservation Office	Dr. Henry Walt
Pueblo of Jemez	Governor David Toledo
Pueblo of Laguna	Governor Wilfred Herrera, Jr.
Pueblo of Nambe	Governor Phillip A. Perez
Pueblo of Nambe, Tribal Historic Preservation Office	Lt. Governor Arnold J. Garcia
Pueblo of Picuris	Governor Craig Quanchello
Pueblo of Pojoaque	Governor Joseph M. Talachy
Pueblo of San Felipe	Governor Anthony Ortiz
Pueblo of San Felipe Department of Natural Resources	Pinu'u Stout, Director
Pueblo of San Ildefonso	Governor Perry Martinez
Pueblo of Sandia	Governor Lawrence Montoya
Pueblo of Santa Ana	Governor Timothy Menchego
Pueblo of Santa Ana Tribal Historic Preservation Office	Director Timothy Menchego
Pueblo of Santa Clara	Governor J. Michael Chavarria
Pueblo of Taos	Governor Edward Concha
Pueblo of Tesuque	Governor Robert Mora, Sr
Pueblo of Zia	Governor Fredrick Medina
Pueblo of Zuni	Governor Val R. Panteah, Sr.
Southern Ute Indian Tribe	Chairwoman Christine Baker-Sage
Ten Southern Pueblo Governor's Council	David Toledo, Chair
The Hope Tribe	Chairman Timothy L. Nuvangyaoma
Ute Mountain Ute Tribe	Chairman Manuel Hart

Appendix G. National Environmental Policy Act Interdisciplinary Team Checklist

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

(EAs & DNAs) - The purpose of this checklist is to document which resource issues need analysis in the NEPA document and to identify the ID team for the NEPA document. Responsible staff will make an initial determination and provide rationale for that determination, which is subject to manager review and concurrence. If warranted, issues or determinations may be changed during the NEPA process (e.g., after external scoping, during review, etc.), but changes must be documented and have Authorized Officer concurrence. All elements need a determination, assigned specialist, rationale, initials, and date. The ID team will include all specialists with a "PI" in the table below, and resources with a "PI" will be addressed in Ch. 3 of the EA.

(CXs) - The purpose of this checklist is to identify the ID team for the categorical exclusion (CX). The ID team will help the project lead develop mitigation measures and determine if extraordinary circumstances apply. DO NOT enter a determination, initials, or date for CX projects. Specialists may provide mitigation measures or extraordinary circumstances in the "Rationale for Determination" column, but it is not necessary at this time.

Project Title: Nageezi Unit M35-2309, B02-2309, G35-2409, and H33-2409 Well Pads, Wells, and Pipelines

NEPA Number: : DOI-BLM-NM-FO10-2020-0029-EA

File/Serial Number:

Project Leader: Smith

DETERMINATION OF STAFF: ***(Choose one of the following abbreviated options for the left column)***

PI = Present with potential for relevant impacts that need to be analyzed in Ch. 3 in the EA.
NP = Not present in the area impacted by the proposed or alternative actions
NI = Present, but not impacted to a degree that analysis is required in Ch. 3 in the EA.
NC = (DNAs only) Actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section D of the DNA form. The Rationale column may include NI and NP discussions.

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
RESOURCES AND ISSUES CONSIDERED (INCLUDES SUPPLEMENTAL AUTHORITIES APPENDIX 1 H-1790-1)					
PI	Air Quality/	(X) W. Thomas ( ) J. Tafoya	**Issue Statement: How would emissions generated by equipment associated with the proposed project impact air quality?**	WT	2/28/2020
PI	Greenhouse Gas Emissions	(x) W. Thomas ( ) J. Tafoya	**Issue Statement: How would the future potential development of the proposed action contribute to greenhouse gas (GHG) emissions?**	WT	2/28/2020
NI	Cultural Resources	(x) K. Adams ( ) E. Simpson ( ) G. Haymes	Four Class III Archaeological Surveys (NMCRIS No. 144910; BLM Report No. 2020(II)010F, NMCRIS No. 144909; BLM Report No. 2020(II)011F, NMCRIS No. 144851; BLM Report No. 2020(II)0013F, NMCRIS No. 144852; BLM Report No. 2020(II)012F) were conducted in the proposed project areas. During two of these surveys no cultural resources were discovered. During the survey for the Nageezi Unit 309H project (2020(II)0013F), two sites were identified. Both of these sites were given a Not Determined eligibility status for listing on the National Register of Historic Places (NRHP) and both sites will require temporary site protection fencing and the presence of an archaeological monitor. During the survey for the Nageezi Unit 608H project (2020(II)012F), two sites were identified, both of which were also given a Not Determined eligibility status for the NRHP. Both of these sites will also require temporary site protection fencing and the presence of an archaeological monitor. A fifth Class III Archaeological Survey was previously conducted for the Nageezi Unit Number 314H/315H/316H/317H/318H Multiple Well Pad, Access Road, and Pipeline project (NMCRIS No. 141538; BLM Report No. 2019(I)007F). During this inventory, two sites were discovered,	KA	10/26/2020

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
			one of which were determined to be Eligible for listing on the NRHP, and the other site was given a Not Determined eligibility status. Both sites will require temporary site protection fencing and the presence of an archaeological monitor. These stipulations can be found in the In-House Survey Determination Form NM-210-2020-028. One more survey associated with this project was completed on tribal land (HPD-20-062). During this survey, one cultural site was discovered (NM-G-47-56). This site was determined to be Not Eligible for listing on the NRHP; therefore, no specific site protection stipulations will be required for this portion of the project. With adherence to the stipulations provided above, the proposed project will have No Effect to historic properties.		
NP	Native American Religious and other Concerns	(x) K. Adams ( ) E. Simpson ( ) G. Haymes	No known TCPs or sensitive cultural areas are present in the proposed project area.	KA	10/26/2020
NI	Paleontology	( ) S. Landon (x) C. Wenman	How would surface disturbance associated with the proposed Nageezi Unit 306H (B02-2309) pipeline route impact paleontological resources that may be contained in the areas where the Nacimiento Formation is exposed? The proposed project is not located within any Specially Designated Area for paleontology, but is located in an area of known paleontological resources within the Nacimiento Formation (PFYC 5). Area of concern for the B02-2309 pipeline route are where the pipeline comes off the bluff along CR 7800 and the associated TUA, potential for paleo resource occurrence is high in this area. No suitable alternative for the pipeline route was identified, paleontological monitoring will be required during construction if the project is approved and potential loss of paleo resources should be disclosed in the EA. Area of concern for the M35-2409 well pad is along the south and southeast sides of the proposed pad where the Nacimiento Formation is exposed. The M35-2409 pad is located near an area that is important for nascent mammal fossil discoveries. Impacts from construction of the well pad can be mitigated by bringing the south and southeast pad edges in so that no exposed Nacimiento Formation is disturbed, and installing permanent barriers (such as jersey barriers) to prevent future disturbance of the formation on the edge of the well pad. Paleo monitoring during construction will be required in case of accidental discovery. Please apply the pad size reduction, barrier installation, and monitoring requirements as COAs if the project is approved. A paleo monitor will also be required during construction of the M35 pad. Please include the standard paleo "accidental discovery" COA as well.	CW	4/28/20
NP	Areas of Critical Environmental Concern	( ) S. Allison ( ) D. McKim (x) Project Lead	No ACEC in project area..	GS	6/4/20
NP	Lands with Wilderness Characteristics	(x) S. Allison ( ) D. McKim	The proposed project is not within or adjacent to any lands determined to be eligible for Lands with Wilderness Characteristics in the 2015 LWC Inventory.	SA	4/7/2020

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
NP	Wilderness	(x) S. Allison ( ) D. McKim	The proposed project is not within or adjacent to either the Bisti/De-Na-Zin or Ah-shi-sle-pah Wilderness.	SA	4/7/2020
PI	Visual Resources	(x) S. Allison ( ) D. McKim	Staff Observation: The proposed project is within an area classified as Visual Resource Management IV. The goals of effecting no more than a strong visual contrast will be achieved by following best management practices and utilizing an appropriate BLM Environmental Color for infrastructure as determined at the onsite. **Issue Statement: How would construction and the facilities associated with the proposed project, primarily the B02 and M35 project areas, impact the scenic quality for the Nageezi community?** Analysis Area: the community of Nageezi and the residential complexes off County Road 7800 (Indian Service Road 45) Impact Causing Elements: Construction and permanent aboveground facilities to the Community of Nageezi's viewshed Impact Indicator: Level of contrast to the landscape from the proposed project as viewed from the KOPs Key Observation Points: Residence near post office (KOP 1) Community/Senior Center (KOP 2) Residence near M35 access road/pipeline (KOP 3)	RJ	7/23/2020
NI	Recreation	( ) D. McKim (x) S. Allison	The proposed project is in an area where dispersed recreation takes place. This project will have no impact on dispersed recreation.	SA	4/7/2020
NP	Fuels/Fire Management	(x) J. Tafoya	The nature and scope of the project will not impact Fuels or Fire Management.	JT	6/24/20
NP	Geology	(x) C. Wenman	No geologic resources exist within the proposed project area that would be impacted by the proposed surface disturbance or subsurface drilling.	CW	4/27/20
NP	Solid Mineral Resources	(x) C. Wenman	No solid mineral resources or mining operations exist within the proposed project area.	CW	4/27/20
NI	Oil and Gas / Energy Production	( ) S. Scott ( ) M. Wirth ( ) C. Wenman X – Project Lead	Depending on the success of oil and gas well drilling, non-renewable natural gas and/or oil would be extracted and delivered to market. Production of oil or gas would result in the irretrievable loss of these resources (i.e., they would no longer be available for future development). The 2003 Farmington RMP committed these resources for oil and gas development.	RJ	7/23/2020
NI	Lands/Access	( ) K Christensen ( ) M. Tilden (x) T. Faust	Numerous ROW are within the project proposed area. The use of mitigation measures will minimize the impacts and protect the existing ROWs. With standard design features and stipulations, no further analysis is needed.	TF	6/25/20
NI	Wastes (hazardous or solid)	( ) W. Thomas ( ) A. Gallegos ( ) C. Wenman X – Project Lead	Project activities would generate waste, including solid and hazardous materials. Typical wastes associated with oil and gas development include produced water, hydrocarbons, and frac fluids among others. Ongoing oil and gas activities include the implementation of measures to reduce or eliminate hazards associated with wastes in compliance with solid and hazardous materials laws and regulations (e.g., implementation of Spill Prevention Control and Countermeasure Plans [SPCC], disposal of wastes at approved facilities, etc.). Implementation of these measures would continue because these measures are required	GS	6/4/20

Project Title:

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
			to maintain compliance with the aforementioned laws and regulations.		
NI	Livestock Grazing	( ) B. Witmore (x) C. Gould ( ) N. Craun ( ) J. Tafoya	The proposed action would not have no impact to the Kimbeto and Largo Grazing Allotment	CG	6/24/2020
NI	Public Land Health Standards	( ) B. Witmore (x) C. Gould ( ) N. Craun ( ) J. Tafoya	No impacts to rangeland health from the proposed project are expected to be negligible given the acreage of the proposed project within the affected Kimbeto and Largo grazing allotment(s). Standard design features/BMPs requiring reclamation will assist in mitigating any impacts. Therefore, no further analysis is needed	CG	6/24/2020
NI	Invasive Species/ Noxious Weeds	(x) H. Perry	Standard Noxious and Invasive Weed design features and any additional design features included in the Surface Use Plan of Operations and as part of the project design features, mitigate impacts, including the potential spread and establishment of noxious or invasive weeds within the project area	HP	6/17/2020
NI	Vegetation Excluding USFWS Designated Species	( ) B. Witmore (x) C. Gould ( ) N. Craun ( ) J. Tafoya	The proposed action would not have impact to BLM FFO vegetation communities in Kimbeto and Largo Community Grazing Allotments	CG	6/24/2020
PI	Special Status Plant Species and Animal Species	(X) J. Kendall	M35 proposed project is within occupied habitat and will likely require transplanting. Cross country Not within policy and will require analysis. Rest of cluster next to/near existing infrastructure	JK	4/2/20
NP	Threatened, Endangered or Candidate Plant and Animal Species	(X) J. Kendall	The proposed project area is not located within suitable or potential habitat, as defined by USFWS; within conformance of 2002 Biological Assessment	JK	4/2/20
NI	Migratory Birds	(X) J. Kendall	Approx 50 acres of poor to marginal migratory bird nesting habitat primarily in the BLM FFO sagebrush and desert scrub communities, would be removed under the Proposed Action. PPA is mostly minimized to extent possible, as per bird policy, except for Xcountry portion. Stipulation: Migratory bird nest surveys required from May 15-July 31. Any nest found will be buffered and avoided until nesting activities are complete.	JK	4/3/20
NP	Wildlife –incl. game species and other terrestrial wildlife	(X) J. Kendall	The proposed project is no located within any designated Wildlife Area. Standard design features/BMPs regarding protection of wildlife, will be implemented to mitigate any impacts. With standard design features/BMPs, no further analysis is needed.	JK	6/22/20
NP	Wildlife-aquatic	(X) J. Kendall	Not within or near any bodies of water that would be impacted from increased sedimentation or other relevant impact by proposed action.	JK	6/22/20
NP	Wetlands/Riparian Zones	(X) J. Kendall	No riparian within ppa	JK	4/3/20
PI	Water Resources/Quality (drinking/surface/ ground)	(X) W. Thomas	How would future drilling and completion operations associated with the Proposed Action impact groundwater quality and quantity?	WT	2/28/2020

Project Title:

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
NP	Soils	(X) W. Thomas	There are no fragile soils present in the project area.	WT	2/28/2020
NP	Wild Horses and Burros	(x) J. Tafoya ( ) B. Witmore ( ) C. Gould ( ) N. Craun	The proposed project is not in a wild horse herd area.	JT	6/24/20
NI	Socio-Economics	(X) L. Henio	Staff Observation: DJR will need to work with FIMO on making sure there is fair compensation for the allottees where the bottom hole is located. My chief concern is drainage from other IA lands surrounding these wells. **SWCA:** DJR will provide information for the process in which they coordinate with the BLM and FIMO in the development of lease unit division and identify drainage patterns prior to unit finalization and approval. This allows for DJR to work closely with FIMO to determine fair compensation for allottee mineral development and management. This information will be captured with adequate rationale within the *Issues Dismissed with Rationale* table within the EA.	RJ	7/23/2020
PI	Environmental Justice	(X) L. Henio	Staff Observation: DJR will need to be in constant contact with the Nageezi Chapter officials and community member throughout the development. Roads and well pads that are proposed are west of the residential area as well as the senior center and chapter house facilities. There is a Post Office as well where the trucks will be turning to get to the site, and they have to be extra careful due to some residents are elderlies who drive. When school is back in session the school buses will be in the area. Community members will be forced to accommodate the trucks by pulling off the pavement, potentially causing an accident – again DJR will be sharing the roads with elderlies. **Issue Statement: How would the development of the proposed project impact environmental justice communities, primarily the community of Nageezi?** **Analysis area:** San Juan County, establish baseline data using demographic information for San Juan County **Impact indicators:** Quality of Life, Traffic, noise, visual, water quantity and quality, and air quality, including GHGs. Please note, we will tie the analysis from the individual resource sections to the Environmental Justice section.	RJ	7/23/2020
PI	**Quality of Life**		**Issue Statement: How would the development of the proposed project impact the quality of life of nearby residents, including the community of Nageezi?** **Analysis Approach:** This analysis will build on the analysis within the other resource sections, including using the analysis areas and impact indicators of noise, visual, dust (air quality). We will also mention night skies within this section.	RJ	7/23/3030
PI	**Noise**	TBD	**Issue Statement: How would noise generated during construction activities, including well drilling/completion, pipeline installation and access road construction, from heavy equipment affect nearby residences?**	RJ	7/23/2020

Project Title:

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
			Analysis area: established sensitive noise receptors (3) within a 3-mile radius. Then we will calculate the rate of noise attenuation (or the reduction rate of noise) and the distance at which the most consistent levels of noise generated from proposed project activities reach the sensitive noise receptors. **Impact indicators:** noise generated from well drilling/completion, pipeline installation, and access road construction		
PI	**Traffic and Public Safety**	TBD	**Issue Statement: How would vehicle traffic and public road safety be impacted along the proposed haul truck route, which includes the community of Nageezi?** **Analysis area:** haul truck route(s) to the well pad(s), including the route on Highway 550 to County Road 7800 (Indian Service Road 45) to the well pads **Impact indicators:** increase in Annual Average Daily Traffic (AADT) and collision/crashes (data will be obtained from NMDOT) from DJR's (or DJR's construction contractors) construction haul trucks	RJ	7/23/2020

[1] Rationale for Determination is required for all "NIs" and "NPs." Write brief issue statements for "PIs."

[2] The appropriate resource specialist or Authorized Officer or NEPA Coordinator entering the determination should enter their initials. Typically, the assigned specialist should enter initials. If a senior specialist or the Authorized Officer assigns a resource specialist to the NEPA project, the senior specialist or Authorized Officer shall enter their initials in this column after making a determination. If the assigned specialist is making the determination from an off-site location (i.e., state office), the project lead may enter their own initials as long as the determination is documented (i.e., email, conversation record, etc.). DO NOT enter someone else's initials.

[3] The date entered should be the date the determination was made by the assigned specialist, senior specialist, or Authorized Officer.

PROJECT-ASSIGNED SPECIALISTS REVIEW:

Reviewer Title	Initials[4]	Date	Comments
NEPA Coordinator or Supervisor	RJ	7/23/2020	I have accepted all of SWCA's changes to the ID team checklist and will take responsibility for any review of those issues that are analyzed in detail for those resources.

[4] Initials in this column indicates that the NEPA Coordinator has reviewed the assigned specialists column and agrees that the specialists that have been assigned or that have entered PIs (for EAs) will be included in the ID Team for the project. This section is typically initialed at the initial project presentation meeting.

INITIAL DETERMINATION REVIEW (*EA or DNA only*):

Reviewer Title	Initials[5]	Date	Comments
NEPA Coordinator or Supervisor	RJ	7/23/2020	EA

[5] Initials in this column indicates that the Authorized Officer or NEPA Coordinator has reviewed the completed checklist after the ID Team entered initial determinations, and the project lead may continue the NEPA process. Initials will not be made here for categorical exclusions (CXs).

Project Title:

Appendix H: Design Features

DJR will adhere to any conditions required by the BLM FFO. Additional project-specific design features will be included as determined during the BLM on-site meeting. DJR has also committed to the following design features and BMPs to lessen impacts to resources. Where applicable, additional details related to the design features may be found in the APD on file at the BLM FFO.

Air Resources

- Areas not required for facilities would be revegetated during interim reclamation.
- Dirt roads would be watered during periods of high use (magnesium chloride, organic-based compounds, and/or polymer compounds could also be used on dirt roads upon approval of the BLM).
- BMPs provided in The Gold Book would be implemented for proposed and existing roads (BLM and U.S. Forest Service 2007).
- Compressor engines 300 horsepower or less used during well production must be rated by the manufacturer as emitting NO_x at 2 grams per horsepower-hour or less to comply with the NMED, Air Quality Bureau's guidance.

Water Resources

- To prevent erosion, certain areas surrounding the proposed site would be recontoured during interim reclamation.
- Culverts and silt traps would be installed as appropriate and where determined during the BLM on-site and facility on-site.

Wildlife, Migratory Birds, and Special Status Species

- Any wildlife encountered within the proposed project area would be avoided and allowed to move out of the proposed project area. No wildlife would be intentionally harmed or harassed.
- Wildlife hazards, such as storage tanks, associated with the proposed project would be fenced or covered, as necessary.
- Because the proposed project would disturb more than 4.0 acres of vegetation, migratory breeding bird nesting surveys would be required if construction activities are scheduled to occur during the migratory bird nesting season (May 15–July 31). If an active nest is encountered, it would be avoided (avoidance buffer to be determined by BLM FFO) and left undisturbed until the nest has failed, or nestlings have fledged. If present, an inactive nest could be cleared by a BLM FFO–approved wildlife biologist.
- DJR would notify the BLM and U.S. Fish and Wildlife Service (USFWS) upon discovery of a dead or injured migratory bird, bald eagle (*Haliaeetus leucocephalus*), or golden eagle (*Aquila chrysaetos*) within or adjacent to the proposed project area. If the BLM becomes aware of such mortality or injury, the BLM would inform DJR. If DJR fails to notify the USFWS of the mortality or injury, the BLM would notify the USFWS. The BLM and the USFWS would then attempt to determine the cause of mortality and identify appropriate mitigation measures to avoid future occurrences.
- Should other special-status species be observed within the proposed project area prior to or during the proposed project, construction would cease, and the BLM FFO would be immediately

contacted. The BLM FFO would then evaluate the resource. Should a discovery be evaluated as significant (protected under the Endangered Species Act, etc.), it would be protected in place until mitigation could be developed and implemented according to guidelines set by the BLM FFO.

- Per BLM FFO Instruction Memorandum No. NM-200-2008-001 (BLM 2008b), an updated pre-construction biological survey could be required for the proposed project if vegetation removal would occur more than 1 year following the previous biological survey.

Soil, Upland Vegetation, and Noxious Weeds and Invasive Species

- Reclamation would follow the guidance provided in the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013). These procedures are referenced in DJR's Surface Reclamation Plan.
- During the pre-disturbance on-site meeting with BLM, a suitable vegetation community from the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013) will be selected by BLM. Plant species will be chosen from the BLM FFO's seed pick list for the selected community.
- A noxious weed inventory utilizing the New Mexico Noxious Weed List (New Mexico Department of Agriculture 2009) and the U.S. Department of Agriculture's (USDA's) Federal Noxious Weed List (Natural Resources Conservation Service 2017; USDA 2010, 2012) will be conducted during the pre-disturbance on-site meeting.
- Identified noxious weeds would be treated prior to new surface disturbance, as determined by the BLM FFO Noxious Weed Coordinator (505-564-7600). A Pesticide Use Proposal (PUP) would be submitted to and approved by the BLM FFO Noxious Weed Coordinator prior to application of any pesticide.
- See the Water Resources section above for erosion-control features.

Cultural Resources

- All cultural resources stipulations would be followed as indicated in the BLM Cultural Resource Records of Review and the COAs. These stipulations may include, but are not limited to, temporary or permanent fencing or other physical barriers, monitoring of earth-disturbing construction, project area reduction and/or specific construction avoidance zones, and employee education.
- All employees, contractors, and subcontractors would be informed by the project proponent that cultural sites are to be avoided by all personnel, personal vehicles, and company equipment, and that it is illegal to collect, damage, or disturb cultural resources, and that such activities on federal and tribal lands are punishable by criminal and or administrative penalties under the provisions of Archaeological Resources Protection Act (ARPA) (16 USC 470aa–mm).
- In the event of a cultural resource's discovery during construction, construction activities would immediately cease in the immediate vicinity of the discovery, and DJR would immediately notify the archaeological monitor, if present, or the BLM. The BLM would then ensure the site is evaluated. Should a discovery be evaluated as significant (e.g., National Register of Historic Places, Native American Graves Protection and Repatriation Act of 1990, ARPA), it would be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM.
- Known sites and sites identified during the pre-construction cultural resources inventory surveys would be avoided.

Paleontological Resources

If any paleontological resources are discovered during activities associated with the proposed project:

- DJR would inform the BLM Authorized Officer.
- Activities in the vicinity of the discovery would be suspended or adjusted to avoid further impacts. The discovery would be protected from damage or looting.
- The Authorized Officer would ensure evaluation of the discovery as soon as possible, but no more than 10 working days after being notified.
- Appropriate measures to mitigate adverse effects to significant paleontological resources would be determined by the Authorized Officer after consulting with the operator.
- Within 10 days, the operator would be allowed to continue construction through the site, or would be given the choice of following the Authorized Officer's instructions for either 1) stabilizing the fossil resource in place and avoiding further disturbance to the fossil resource or 2) mitigating impacts to the fossil resource prior to continuing construction through the proposed project area.

Visual Resources and Dark Skies

- Equipment not subject to safety requirements would be painted a BLM standard environmental color (covert green) to minimize contrast with the surrounding landscape.
- If applicable, during reclamation, stockpiled rocks, if available, would be placed within the reclaimed area for erosion control and/or to discourage off-highway vehicle traffic (if requested by the BLM FFO). Rocks would be placed in a manner that visually blends with the adjacent, undisturbed landscape.
- Lights would be limited to those needed for safety during construction and operations.
- Lighting would be downward-facing or shielded where possible.

Livestock Grazing and Rangeland Health Standards

- Livestock grazing operators in the vicinity of the proposed project area would be contacted prior to construction.
- Safety meetings would be conducted prior to construction to increase awareness of livestock, such as the presence of open range and driving speed to avoid livestock collisions.
- To the extent feasible, construction activities would not be conducted when livestock are present within the proposed project area.
- If livestock are present during construction, barriers would be placed to ensure that livestock do not come in contact with potential hazards. Barrier examples could include fencing of exposed ditch-type holes; covering of holes when personnel are not present on-site; and containing contaminants, fluid leaks, or hazards that could cause injury to livestock.

Public Health and Safety

- The hauling of equipment and materials on public roads would comply with NMDOT regulations. Any accidents involving persons or property would be reported to the BLM FFO. DJR would notify the public of potential hazards by posting signage, having flaggers, or using lighted signs, as necessary.

- Worker safety incidents would be reported to the BLM FFO as required under NTL–3A (USGS 1979). DJR would adhere to company safety policies and Occupational Safety and Health Administration (OSHA) regulations.
- Vehicles would be restricted to proposed and existing disturbance areas.
- The proposed site would have an informational sign delineating Operator, Legal Description, etc.
- Oil and gas industry traffic is expected to adhere to all posted speed limits and signs. Drivers would be appropriately licensed and inspected.

Weeds

Farmington Field Office Standard Noxious/Invasive Weeds Design Features and Best Management Practices

Noxious/Invasive Weeds: DJR will inventory the proposed site for the presence of noxious and invasive weeds. Noxious weeds are those listed on the New Mexico Noxious Weed List and USDA's Federal Noxious Weed List. The New Mexico Noxious Weed List or USDA's Noxious Weed List can be updated at any time and should be regularly check for any changes. Invasive species may or may not be listed as noxious weeds but have been identified to likely cause economic or environmental harm or harm to human health. The following noxious weeds have been identified as occurring on land within the boundaries of the FFO. Numerous invasive species occur in the BLM FFO area, such as Russian thistle (*Salsola* spp.) and field bindweed (*Convolvulus arvensis*).

Russian knapweed (*Centaurea repens*)	Musk thistle (*Carduus nutans*)
Bull thistle (*Cirsium vulgare*)	Canada thistle (*Cirsium arvense*)
Scotch thistle (*Onopordum acanthium)*	Hoary cress (*Cardaria draba*)
Perennial pepperweed (*Lepidium latifolium*)	Halogeton (*Halogeton glomeratus*)
Spotted knapweed (*Centaurea maculosa*)	Dalmation toadflax (*Linaria genistifolia*)
Yellow toadflax (*Linaria vulgaris*)	Camelthorn (*Alhagi pseudalhagi*)
African rue (*Peganum harmala*)	Saltcedar (*Tamarix* spp.)
Diffuse knapweed (*Centaurea diffusa*)	Leafy spurge (*Euphorbia esula*)

a. Any identified weeds will be treated prior to new surface disturbance if determined by the FFO Noxious Weed Coordinator. If a Weed Management Plan is not on file, a Weed Management Plan will be created. A PUP will be submitted to and approved by the FFO Noxious Weed Coordinator prior to application of pesticide. The FFO Noxious Weeds Coordinator (505-564-7600) can provide assistance in the development of the PUP.

b. Vehicles and equipment should be inspected and cleaned prior to coming onto the site. This is especially important for vehicles from out of state or if coming from a weed-infested site.

c. Fill dirt or gravel may be needed for excavation, road construction/repair, or as a surfacing material. If fill dirt or gravel will be required, the source shall be noxious weed free and approved by the FFO Noxious Weed Coordinator.

d. The site shall be monitored for the life of the project for the presence of noxious weeds (includes maintenance and construction activities). If weeds are found, the FFO Coordinator shall be notified at (505) 564-7600 and provided with a Weed Management Plan and, if necessary, a PUP. The FFO Coordinator can provide assistance developing the Weed Management Plan and/or the PUP.

e. Only pesticides authorized for use on BLM land would be used and applied by a licensed pesticide applicator. The use of pesticides would comply with federal and state laws and used only in accordance with their registered use and limitations. DJR's weed-control contractor would contact the BLM FFO prior to using these chemicals.

   Noxious/invasive weed treatments must be reported to the FFO Noxious Weed Coordinator. A Pesticide Use Report (PUR) is required to report any mechanical, chemical, biological, or cultural treatments used to eradicate and/or control noxious or invasive species. Reporting will be required quarterly and annually or per request from the FFO Noxious Weed Coordinator.

Bare ground vegetation trim-out:

DJR Operating

DJR OPERATING, LLC

BARE GROUND VEGETATION TRIM-OUT DESIGN

ATTACHED TO

SURFACE PLAN OF OPERATIONS

Facility/ Structure	Required Trim-Out Buffer Distance	Pesticide Use for Vegetation Control	Pesticide Use Plan On file with BLM
Well Head	10′	Yes	Yes
Tanks/Containment	10′	Yes	Yes
Gas Lift Compressors	10′	Yes	Yes
Metering Equipment	10′	Yes	Yes
SCC (Smokeless Combustion Chamber	10′	Yes	Yes

a. Pesticide use for trim-out will require a PUP submitted for approval by the FFO Noxious Weed Coordinator. A PUP is required prior to any treatment. Only pesticides authorized for use on BLM land would be used and applied by a licensed pesticide applicator. The use of pesticides would comply with federal and state laws and used only in accordance with their registered use and limitations. DJR's weed-control contractor would contact the BLM FFO prior to using these chemicals and provide Pesticide Use Reports (PURs) post treatment.

   A PUR is required to report any mechanical, chemical, biological, or cultural treatments used to eradicate, or control vegetation on site. Reporting will be required quarterly and annually or per request from the FFO Noxious Weed Coordinator.

Appendix I: Preliminary Draft of Emissions Summary Tables

Company Name: DJR Operating, LLC
Field Name: San Juan County
Facility Name: Nageezi Unit B02 2309

New Mexico Air Quality Application Emission Summary Sheet

Production Equipment Potential Emission Rate

			NOx		CO		SO2		PM 2.5		PM 10		Total Particulates		VOC		Total HAPs	
Ref No.	Equipment	Note	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
ENG-1 & 2	(2) Caterpillar CG137-12 Compressor Engines		2.65	11.59	5.29	23.17	0.00	0.01	0.16	0.72	0.16	0.72	0.16	0.72	1.85	8.11	0.19	0.84
VRU-3 - VRU-5	(3) GM 5.7L VRU Engines		0.58	2.55	0.56	2.55	0.00	0.00	0.04	0.18	0.04	0.18	0.04	0.18	0.29	1.27	0.03	0.12
GEN-1 & GEN-2	(2) Capstone C65 Electric Generation Engines		0.05	0.23	0.13	0.59	0.00	0.00	0.03	0.12	0.03	0.12	0.03	0.12	0.01	0.05	0.03	0.13
HT-1 - HT-8	(2) 0.75 MMBtu/hr and (6) 0.25 MMBtu/hr Indirect Heaters	a	0.42	1.82	0.35	1.53	0.00	0.01	0.01	0.02	0.02	0.07	0.02	0.09	0.02	0.09	0.00	0.00
VRT-1 - VRT-3	(2) Vapor Recovery Towers	b	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.51	3.18	0.36	0.08
TK-1 - TK-5	(6) 400 bbl Comingled Liquid Storage Tanks		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	1.47	0.01	0.04
FUG-1	Fugitives	c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39	6.08	0.46	2.03
ECD-1 - ECD-4	(2) Enclosed Combustion Devices	d	0.02	0.10	0.19	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	1.01	0.00	0.00
P-1	Pneumatics (Liquid Level Controllers & Pump)	e	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.92	21.53	0.07	0.31
	Total		3.72	16.29	6.52	28.68	0.01	0.02	0.24	1.04	0.25	1.09	0.25	1.11	23.56	42.79	1.15	3.55

NOTES: a - Burner emissions based on EPA AP-42 emission factors from Section 1.4, Tables 1.4-1 and 1.4-2 for uncontrolled natural gas burners, it is assumed that burners operate 8,760 hours per year, and a fuel heating value of 1174.63 Btu/SCF

b - Vapor Recovery Tower is process equipment that has the VRU taking the gas to sales. The emissions estimate from the VRT accounts for 5% downtime of the VRU for maintenance.

c - Fugitive emissions of VOC/HAP from leaking connectors, valves, tank hatches, and relief vent/valves. Emission Factors from USEPA AP-42 Oil and Gas Production Facilities.

d - ECD emissions account for pilot gas and NOx,CO,and SO2 emissions from all controlled sources. The controlled VOC and HAP emissions have been allocated back to the individual contributing source.

e - Pneumatic VOC/HAP emissions based on VOC/HAP fraction of the field gas, and consumption rates of typical equipment used in this field area.

^ - Emissions from Excel Workbook
* - Emissions from Air_Emission_Calc_Tool

Company Name: DJR Operating, LLC
Field Name: San Juan County
Facility Name: Nageezi Unit G35 2409

New Mexico Air Quality Application Emission Summary Sheet

Production Equipment Controlled Emission Rate

			NOx		CO		SO2		PM 2.5		PM 10		Total Particulates		VOC		Total HAPs	
Ref No.	Equipment	Note	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
ENG-1 - ENG-3	(3) Caterpillar CG137-12 Compressor Engines		3.62	15.84	7.23	31.69	0.00	0.01	0.09	0.40	0.09	0.40	0.09	0.40	2.53	11.09	0.73	3.19
VRU-1 - VRU-4	(4) GTA8.3 VRU Engines		0.78	3.40	1.16	5.10	0.00	0.00	0.03	0.11	0.03	0.11	0.03	0.11	0.39	1.70	0.06	0.24
GEN-1 & GEN-2	(2) Capstone C65 Electric Generation Engines		0.05	0.23	0.13	0.59	0.00	0.00	0.03	0.12	0.03	0.12	0.03	0.12	0.01	0.05	0.03	0.13
HT-1 - HT-13	(5) 0.75 MMBtu/hr and (8) 0.25 MMBtu/hr Indirect Heaters	a	0.48	2.10	0.40	1.77	0.00	0.01	0.01	0.03	0.02	0.09	0.03	0.12	0.03	0.11	0.00	0.00
VRT-1 - VRT-4	(2) Vapor Recovery Towers	b	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.90	1.75	0.45	1.75
TK-1 - TK-8	(8) 400 bbl Comingled Liquid Storage Tanks		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	10.06	0.03	0.03
FUG-1	Fugitives	c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.03	35.17	0.19	0.84
ECD-1 - ECD-2	(2) Enclosed Combustion Devices	d	0.20	0.87	0.44	1.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	3.97	0.00	0.00
P-1	Pneumatics (Liquid Level Controllers & Pump)	e	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.82	16.74	0.01	0.03
SSM	Startup, Shutdown, Maintenance Emissions		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
Malfunction	Malfunction Emissions		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
	Total		5.12	22.43	9.38	41.09	0.01	0.03	0.15	0.66	0.17	0.72	0.17	0.75	25.91	100.64	1.49	6.21

NOTES: a - Burner emissions based on EPA AP-42 emission factors from Section 1.4, Tables 1.4-1 and 1.4-2 for uncontrolled natural gas burners, it is assumed that burners operate 8,760 hours per year, and a fuel heating value of 1174.63 Btu/SCF

b - Vapor Recovery Tower is process equipment that has the VRU taking the gas to sales. The emissions estimate from the VRT accounts for 5% downtime of the VRU for maintenance.

c - Fugitive emissions of VOC/HAP from leaking connectors, valves, tank hatches, and relief vent/valves. Emission Factors from USEPA AP-42 Oil and Gas Production Facilities.

d - ECD emissions account for pilot gas and NOx,CO,and SO2 emissions from all controlled sources. The controlled VOC and HAP emissions have been allocated back to the individual contributing source.

e - Pneumatic VOC/HAP emissions based on VOC/HAP fraction of the field gas, and consumption rates of typical equipment used in this field area.

^ - Emissions from Excel Workbook

* - Emissions from Air_Emission_Calc_Tool

Company Name: DJR Operating, LLC
Field Name: San Juan County
Facility Name: Nageezi Unit H33 2049

New Mexico Air Quality Application Emission Summary Sheet

Production Equipment Potential Emission Rate

			NOx		CO		SO2		PM 2.5		PM 10		Total Particulates		VOC		Total HAPs	
Ref No.	Equipment	Note	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
ENG-1	(1) Caterpillar CG137-12 Compressor Engines		1.21	5.29	2.42	10.59	0.00	0.00	0.08	0.36	0.08	0.36	0.08	0.36	1.15	5.03	0.36	1.57
VRU-1 - VRU-2	(2) GM 5.7L VRU Engines		0.33	1.43	0.33	1.43	0.00	0.00	0.03	0.11	0.03	0.11	0.03	0.11	0.20	0.88	0.01	0.05
GEN-1 & GEN-2	(2) Capstone C65 Electric Generation Engines		0.05	0.23	0.13	0.59	0.00	0.00	0.03	0.12	0.03	0.12	0.03	0.12	0.01	0.05	0.03	0.13
HT-1 - HT-8	(2) 0.75 MMBtu/hr and (6) 0.25 MMBtu/hr Indirect Heaters	a	0.36	1.57	0.30	1.32	0.00	0.00	0.03	0.12	0.03	0.12	0.03	0.12	0.02	0.10	0.00	0.00
VRT-1 - VRT-2	(2) Vapor Recovery Towers	b	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.35	4.24	0.48	0.11
TK-1 - TK-5	(6) 400 bbl Comingled Liquid Storage Tanks		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	2.24	0.01	0.05
WT-1 - WT-2	(2) 400 bbl Produced Water Storage Tank		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	2.84	0.02	0.10
OILLOAD-1	Oil Tank Truck Loading	c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.56	5.04	0.02	0.10
PWLOAD-1	Water Tank Truck Loading		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.04	0.00	0.00
FUG-1	Fugitives	c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39	6.08	0.46	2.03
HR-1	Haul Road		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.03	0.84	2.99	0.00	0.00	0.00	0.00
ECD-1 - ECD-2	(2) Enclosed Combustion Devices	d	0.04	0.20	0.10	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.76	0.00	0.00
P-1	Pneumatics (Liquid Level Controllers & Pump)	e	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.92	21.53	0.07	0.31
	Total		1.99	8.72	3.28	14.37	0.01	0.00	0.16	0.71	0.38	0.74	1.00	3.70	45.10	48.83	1.46	4.45

NOTES: a - Burner emissions based on EPA AP-42 emission factors from Section 1.4, Tables 1.4-1 and 1.4-2 for uncontrolled natural gas burners, it is assumed that burners operate 8,760 hours per year, and a fuel heating value of 1174.63 Btu/SCF

b - Vapor Recovery Tower is process equipment that has the VRU taking the gas to sales. The emissions estimate from the VRT accounts for 5% downtime of the VRU for maintenance.

c - Fugitive emissions of VOC/HAP from leaking connectors, valves, tank hatches, and relief vent/valves. Emission Factors from USEPA AP-42 Oil and Gas Production Facilities.

d - ECD emissions account for pilot gas and NOx,CO,and SO2 emissions from all controlled sources. The controlled VOC and HAP emissions have been allocated back to the individual contributing source.

e - Pneumatic VOC/HAP emissions based on VOC/HAP fraction of the field gas, and consumption rates of typical equipment used in this field area.

^ - Emissions from Excel Workbook

* - Emissions from Air_Emission_Calc_Tool

Company Name: DJR Operating, LLC
Field Name: San Juan County
Facility Name: Nageezi Unit M35 2409

New Mexico Air Quality Application Emission Summary Sheet

Production Equipment Controlled Emission Rate

			NOx		CO		SO2		PM 2.5		PM 10		Total Particulates		VOC		Total HAPs	
Ref No.	Equipment	Note	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
ENG-1 - ENG-3	(3) Caterpillar CG137-12 Compressor Engines		3.62	15.84	7.23	31.69	0.00	0.01	0.09	0.40	0.09	0.40	0.09	0.40	2.53	11.09	0.73	3.19
VRU-1 - VRU-4	(4) GTA8.3 VRU Engines		0.78	3.40	1.16	5.10	0.00	0.00	0.03	0.11	0.03	0.11	0.03	0.11	0.39	1.70	0.06	0.24
GEN-1 & GEN-2	(2) Capstone C65 Electric Generation Engines		0.05	0.23	0.13	0.59	0.00	0.00	0.03	0.12	0.03	0.12	0.03	0.12	0.01	0.05	0.03	0.13
HT-1 - HT-13	(5) 0.75 MMBtu/hr and (8) 0.25 MMBtu/hr Indirect Heaters	a	0.48	2.10	0.40	1.77	0.00	0.01	0.01	0.03	0.02	0.09	0.03	0.12	0.03	0.11	0.00	0.00
VRT-1 - VRT-4	(2) Vapor Recovery Towers	b	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.90	1.75	0.45	1.75
TK-1 - TK-8	(8) 400 bbl Comingled Liquid Storage Tanks		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	10.06	0.03	0.03
FUG-1	Fugitives	c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.03	35.17	0.19	0.84
ECD-1 - ECD-2	(2) Enclosed Combustion Devices	d	0.20	0.87	0.44	1.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	3.97	0.00	0.00
P-1	Pneumatics (Liquid Level Controllers & Pump)	e	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.82	16.74	0.01	0.03
SSM	Startup, Shutdown, Maintenance Emissions		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
Malfunction	Malfunction Emissions		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
	Total		**5.12**	**22.43**	**9.38**	**41.09**	**0.01**	**0.03**	**0.15**	**0.66**	**0.17**	**0.72**	**0.17**	**0.75**	**25.91**	**100.64**	**1.49**	**6.21**

NOTES: a - Burner emissions based on EPA AP-42 emission factors from Section 1.4, Tables 1.4-1 and 1.4-2 for uncontrolled natural gas burners, it is assumed that burners operate 8,760 hours per year, and a fuel heating value of 1174.63 Btu/SCF

b - Vapor Recovery Tower is process equipment that has the VRU taking the gas to sales. The emissions estimate from the VRT accounts for 5% downtime of the VRU for maintenance.

c - Fugitive emissions of VOC/HAP from leaking connectors, valves, tank hatches, and relief vent/valves. Emission Factors from USEPA AP-42 Oil and Gas Production Facilities.

d - ECD emissions account for pilot gas and NOx,CO,and SO2 emissions from all controlled sources. The controlled VOC and HAP emissions have been allocated back to the individual contributing source.

e - Pneumatic VOC/HAP emissions based on VOC/HAP fraction of the field gas, and consumption rates of typical equipment used in this field area.

^ - Emissions from Excel Workbook

* - Emissions from Air_Emission_Calc_Tool

Appendix J: Phases of Oil and Gas Development

Construction Activities

Clearing of the proposed well pad and access road would be limited to the smallest area possible to provide safe and efficient work areas for all phases of construction. First, all new construction areas need to be cleared of all vegetation. All clearing activities are typically accomplished by cutting, mowing, and/or grading vegetation as necessary. Cut vegetation may be mulched and spread on-site or hauled to a commercial waste disposal facility.

Next, heavy equipment, including but not limited to, bulldozers, graders, front-end loaders, and/or track hoes are used to construct, at a minimum, the pad. Other features, as needed for development, may include, but are not limited to, an access road, reserve pit, pipeline, and/or fracturing pond. Cut and fills may be required to level the pad or road surfaces. If a reserve pit is authorized, it would be lined using an impermeable liner or other lining mechanism (i.e., bentonite or clay) to prevent fluids from leeching into the soil. Access roads may have cattle guards, gates, drainage control, or pull-outs installed, among a host of other features that may be necessary based on the site-specific situation. Long-term surfaces are typically dressed with a layer of crushed rock or soil cemented. Construction materials come from a variety of sources. Areas not needed for long-term development (i.e., portions of the pipeline or road right-of-way [ROW]) are reclaimed by recontouring the surface and establishing vegetation.

If a pipeline is needed, the ROW would be cleared of all vegetation. The pipeline would be laid out within the cleared section. A backhoe, or similar piece of equipment, would dig a trench at least 36 inches below the surface. After the trench is dug, the pipes would be assembled by welding pieces of pipe together and bending them slightly, if necessary, to fit the contour of the pipeline's path. Once inspected, the pipe can be lowered into the trench and covered with stockpiled subsoil that was originally removed from the hole. Each pipeline undergoes hydrostatic testing prior to natural gas being pumped through the pipeline. This ensures the pipeline is strong enough and absent of any leaks.

Drilling Operations

When the pad is complete, the drilling rig and associated equipment would be moved on-site and erected. A conventional rotary drill rig with capability matched to the depth requirements of the proposed well(s) would be used. The well could be drilled as a horizontal well to target the desired formation. The depth of the well is entirely dependent on the target formation depth.

When a conventional reserve pit system is proposed, drilling fluid or mud is circulated through the drill pipe to the bottom of the hole, through the bit, up the bore of the well, and finally to the surface. When mud emerges from the hole, it enters into the reserve pit, where it would remain until all fluids are evaporated and the solids can be buried.

A closed-loop system operates in a similar fashion except that when the mud emerges from the hole, it passes through a series of equipment used to screen and remove drill cuttings (rock chips) and sand-sized solids rather than going into the pit. When the solids have been removed, the mud would be placed into holding tanks, and from the tank, used again.

In either situation the mud is maintained at a specific weight and viscosity to cool the bit, seal off any porous zones (thereby protecting aquifers or preventing damage to producing zone productivity), control subsurface pressure, lubricate the drill string, clean the bottom of the hole, and bring the drill cuttings to the surface. Water-based or oil-based muds can be used and is entirely dependent on the site-specific conditions.

Completion Operations

Once a well has been drilled, completion operations would begin once crews and equipment are available. Well completion involves setting casing to depth and perforating the casing in target zones.

Wells are often treated during completion to improve the recovery of hydrocarbons by increasing the rate and volume of hydrocarbons moving from the natural oil and gas reservoir into the wellbore. These processes are known as well-stimulation treatments, which create new fluid passageways in the producing formation or remove blockages within existing passageways. They include fracturing, acidizing, and other mechanical and chemical treatments often used in combination. The results from different treatments are additive and complement each other.

Hydraulic Fracturing

Hydraulic fracturing is one technological key to economic recovery of oil and gas that might have been left by conventional oil and gas drilling and pumping technology. It is a formation stimulation practice used to create additional permeability in a producing formation, thus allowing gas to flow more readily toward the wellbore. Hydraulic fracturing can be used to overcome natural barriers, such as naturally low permeability or reduced permeability resulting from near wellbore damage, to the flow of fluids (gas or water) to the wellbore (Groundwater Protection Council 2009). The process is not new and has been a method for additional oil and gas recovery since the early 1900s; however, with the advancement of technology it is more commonly used.

Hydraulic fracturing is a process that uses high-pressure pumps to pump fracturing fluid into a formation at a calculated, predetermined rate and pressure to generate fractures or cracks in the target formation. For shale development, fracture fluids are primarily water-based fluids mixed with additives that help the water to carry proppants into the fractures, which may be made up of sand, walnut hulls, or other small particles of materials. The proppant is needed to "prop" open the fractures once the pumping of fluids has stopped. Once the fracture has initiated, additional fluids are pumped into the wellbore to continue the development of the fracture and to carry the proppant deeper into the formation. The additional fluids are needed to maintain the downhole pressure necessary to accommodate the increasing length of the opened fracture in the formation.

Hydraulic fracturing of horizontal shale gas wells is performed in stages. Lateral lengths in horizontal wells for development may range from 1,000 feet to more than 5,000 feet. Depending on the lengths of the laterals, treatment of wells may be performed by isolating smaller portions of the lateral.
The fracturing of each portion of the lateral wellbore is called a stage. Stages are fractured sequentially beginning with the section at the farthest end of the wellbore, moving uphole as each stage of the treatment is completed until the entire lateral well has been stimulated.

This process increases the flow rate and volume of reservoir fluids that move from the producing formation into the wellbore. The fracturing fluid is typically more than 99% water and sand, with small amounts of readily available chemical additives used to control the chemical and mechanical properties of the water and sand mixture (see Table J.1 below).

Because the fluid is composed mostly of water, large volumes of water are usually needed to perform hydraulic fracturing. However, in some cases, water is recycled or produced water is used.

Chemicals serve many functions in hydraulic fracturing, from limiting the growth of bacteria to preventing corrosion of the well casing. Chemicals are needed to ensure the hydraulic fracturing job is effective and efficient. The fracturing fluids used for shale stimulations consist primarily of water but also include a variety of additives. The number of chemical additives used in a typical fracture treatment

varies depending on the conditions of the specific well being fractured. A typical fracture treatment will use very low concentrations of between three and 12 additive chemicals depending on the characteristics of the water and the shale formation being fractured. Each component serves a specific, engineered purpose. The predominant fluids currently being use for fracture treatments in the shale gas plays are water-based fracturing fluids mixed with friction-reducing additives, also known as slickwater (Groundwater Protection Council 2009).

The make-up of fracturing fluid varies from one geologic basin or formation to another. Because the make-up of each fracturing fluid varies to meet the specific needs of each area, there is no one-size-fits-all formula for the volumes for each additive. In classifying fracture fluids and their additives, it is important to realize that service companies that provide these additives have developed a number of compounds with similar functional properties to be used for the same purpose in different well environments. The difference between additive formulations may be as small as a change in concentration of a specific compound (Groundwater Protection Council 2009).

Typically, the fracturing fluids consist of about 99% water and sand and about 1% chemical additives. The chemical additives are essential to the process of releasing gas trapped in shale rock and other deep underground formations.

Some soils and geologic formations contain low levels of radioactive material. This naturally occurring radioactive material (NORM) emits low levels of radiation, to which everyone is exposed on a daily basis. When NORM is associated with oil and natural gas production, it begins as small amounts of uranium and thorium within the rock. These elements, along with some of their decay elements, notably Radium-226 and Radium-228, can be brought to the surface in drill cuttings and produced water. Radon-222, a gaseous decay element of radium, can come to the surface along with the shale gas. When NORM is brought to the surface, it remains in the rock pieces of the drill cuttings, remains in solution with produced water, or, under certain conditions, precipitates out in scales or sludges. The radiation is weak and cannot penetrate dense materials such as the steel used in pipes and tanks.

Before operators or service companies perform a hydraulic fracturing treatment, a series of tests are performed. These tests are designed to ensure that the well, casing, well equipment, and fracturing equipment are in proper working order and would safely withstand the application of the fracture treatment pressures and pump flow rates.

To ensure that hydraulic fracturing is conducted in a safe and environmentally sound manner, the BLM approves and regulates all drilling and completion operations, and related surface disturbance on federal public land. Operators must submit Applications for Permit to Drill (APDs) to the agency. Prior to approving an APD, a BLM Field Office geologist identifies all potential subsurface formations that would be penetrated by the wellbore. This includes all groundwater aquifers and any zones that would present potential safety or health risks that may need special protection measures during drilling, or that may require specific protective well construction measures.

Once the geologic analysis is completed, the BLM reviews the company's proposed casing and cementing programs to ensure the well construction design is adequate to protect the surface and subsurface environment, including the potential risks identified by the geologist and all known or anticipated zones with potential risks.

During drilling, the BLM is on location during the casing and cementing of the groundwater protective surface casing and other critical casing and cementing intervals. Before hydraulic fracturing takes place, all surface casing and some deeper, intermediate zones are required to be cemented from the bottom of the cased hole to the surface. The cemented well is pressure tested to ensure there are no leaks and a cement bond log is run to ensure the cement has bonded to the casing and the formation. If the fracturing

of the well is considered to be a “non-routine” fracture for the area, the BLM would always be on-site during those operations as well as when abnormal conditions develop during the drilling or completion of a well.

Production Operations

Production equipment used during the life of the well may include a three-phase separator-dehydrator; flowlines; a meter run; tanks for condensate, produced oil, and water; and heater treater. A pump jack may be required if the back pressure of the well is too high. Production facilities are arranged to facilitate safety and maximize reclamation opportunities. All permanent aboveground structures not subject to safety considerations are painted a standard BLM environmental color or as landowner specified.

Workovers may be performed multiple times over the life of the well. Because gas production usually declines over the years, operators perform workover operations which involve cleaning, repairing, and maintaining the well for the purposes of increasing or restoring production.

Anticipated use or produced hazardous materials during the development may come from drilling materials; cementing and plugging materials; hydraulic fracturing materials; production products (natural gas, condensates, produced water); fuels and lubricants; pipeline materials; combustion emissions; and miscellaneous materials. Table J.1 includes some of the common wastes (hazardous and nonhazardous) that are produced during oil and gas development.

Table J.1. Common Wastes Produced during Oil and Gas Development

Phase	Waste	
Construction	Domestic wastes (e.g., food scraps, paper, etc.)	
	Excess construction materials	Woody debris
	Used lubricating oils	Paints
	Solvents	Sewage
	Drilling muds, including additives (i.e., chromate and barite) and cuttings	
	Well drilling, completion, workover, and stimulation fluids (i.e., oil derivatives such as polycyclic aromatic hydrocarbons [PAHs], spilled chemicals, suspended and dissolved solids, phenols, cadmium, chromium, copper, lead, mercury, nickel)	
	Equipment, power unit and transport maintenance wastes (i.e., batteries, used filters, lubricants, oil, tires, hoses, hydraulic fluids, paints, solvents)	
	Fuel and chemical storage drums and containers	
	Cementing wastes	Rigwash
	Production testing wastes	Excess drilling chemicals
	Excess construction materials	Processed water
	Scrap metal	Contaminated soil
	Sewage	Domestic wastes
Hydraulic Fracturing	See below	
Production	Power unit and transport maintenance wastes (i.e., batteries, used filters, lubricants, filters, tires, hoses, coolants, antifreeze, paints, solvents, used parts)	
	Discharged produced water	
	Production chemicals	
	Workover wastes (e.g., brines)	

Phase	Waste
Abandonment / Reclamation	Construction materials
	Decommissioned equipment
	Contaminated soil

Literature Cited

Groundwater Protection Council. 2009. *Modern Shale Gas Development in the United States: A Primer*. Prepared for the U.S. Department of Energy, Office of Fossil Energy, and National Energy Technology Laboratory (NETL). DE-FG26-04NT15455. Oklahoma City, Oklahoma. Available at: https://energy.gov/fe/downloads/modern-shale-gas-development-united-states-primer.

Appendix K: Visual Contrast Rating Worksheets

Save Print Clear

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 07/21/2020
District Office: BLM FFO
Field Office: Farmington
Land Use Planning Area: Oil Well

SECTION A. PROJECT INFORMATION

1. Project Name DJR NU 2309-2409 Cluster Project	4. KOP Location (T.R.S) Section 1, T. 23N., R. 9W.	5. Location Sketch See photographs in section 3.6 of the EA
2. Key Observation Point (KOP) Name KOP 1		
3. VRM Class at Project Location Class IV	(Lat. Long) 36.262959°, -107.747977°	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat terrain, flat background and flat foreground	Clear uniformity in background and diffuse blocks from shrubs and trees in mid and foreground	Overhead power line in mid to background. Fence line in foreground. O&G gas tank in background.
LINE	Horizontal, small undulation of ridge in the distance.	Flat and undulating in mid and background, jagged in foreground	Curving lines for O&G tank and flat lines from fence and overhead power line.
COLOR	Light brown, yellow-tan, reddish-tan, l	Blue-green, yellow-green, slate gray, dark gray/green, tan	Dark brown, steel gray, and rusted white
TEX-TURE	Coarse mid and foreground, smooth background	Coarse mid and foreground, smooth background	Smooth lines

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat forms from the the pad constuction	Short, smooth, undulating lines from temporary disturbance, construction, reclamation and contouring in foreground	Block-like forms from completion of tanks within VRM; upright forms during construction
LINE	Near horizontal from temp disturbance for pad construction and flat horizontal lines post construction.	Straight bladed lines from workspace edges and clear, flat lines were vegetation is removed	Ground and mid range lines.
COLOR	Some tan and gray colors expected from the ground disturbance	Areas of lighter and brighter green where reclamation would occur	Tan and gray colors expected from the disturbance and pad consticton.
TEX-TURE	Smooth where disturbance has occurred	Smooth from temporary disturbance and jagged from reclaimed vegetation growth.	Smooth

SECTION D. CONTRAST RATING __SHORT TERM ✓LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1) STRONG	MODERATE	WEAK	NONE	VEGETATION (2) STRONG	MODERATE	WEAK	NONE	STRUCTURES (3) STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			✓				✓			✓		
	LINE			✓				✓			✓		
	COLOR			✓				✓			✓		
	TEXTURE			✓				✓			✓		

2. Does project design meet visual resource management objectives? ✓Yes ___No
(Explain on reverses side)

3. Additional mitigating measures recommended
___Yes ✓No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants
Date: 07/21/2020

(Continued on Page 2)
(Form 8400-4)

SECTION D. (Continued)

Comments from item 2.

This project is evaluated as a long-term. The proposed project that goes through the VRM Class IV area will contain permanent aboveground infrastructure. The KOP was identified for proximity of the project to a residential area that would view the proposed infrastructure. Long-term impacts to the view-shed at the KOP would result from the introduction of new human-made elements in the form of a oil/gas well pad, tanks, and a production facility. Portions of the proposed project area will be reclaimed with native seed mixture after construction and vegetation is expected to regrow within two years, reducing visual disturbance. The production facility and any large aboveground infrastructure would be camouflaged and concealed to blend into the existing terrain and vegetation. This proposed project would conform to the objective of VRM Class IV management objectives by following the mitigation measures outlined in section 3.6 of the EA.

Additional Mitigating Measures (See item 3)

Save | Print | Clear

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 07/21/2020
District Office: BLM FFO
Field Office: Farmington
Land Use Planning Area: Oil Well

SECTION A. PROJECT INFORMATION

1. Project Name DJR NU 2309-2409 Cluster Project	4. KOP Location (T.R.S) Section 1, T. 23N., R. 9W.	5. Location Sketch See photographs in section 3.6 of the EA
2. Key Observation Point (KOP) Name KOP 2		
3. VRM Class at Project Location Class IV	(Lat. Long) 36.259941°, -107.749009°	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat terrain with small undulations in mid fore and background	Diffuse blocks from shrubs and trees in mid and foreground	
LINE	Horizontal, small undulation of ridge in the distance.	Flat and undulating in mid and background, jagged in foreground	
COLOR	Light brown, yellow-tan, reddish-tan, steel gray	Blue-green, yellow-green, slate gray, dark gray/green, tan	
TEX-TURE	Coarse and sharp mid and foreground, smooth background	Coarse mid and foreground, smooth background	

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat forms from the the pad constuction	Short, smooth, undulating lines from temporary disturbance, construction, reclamation and contouring in foreground	Block-like forms from completion of tanks within VRM; upright forms during construction
LINE	Near horizontal from temp disturbance for pad construction and flat horizontal lines post construction.	Straight bladed lines from workspace edges and clear, flat lines were vegetation is removed	Ground and mid range lines.
COLOR	Some tan and gray colors expected from the ground disturbance	Areas of lighter and brighter green where reclamation would occur	Tan and gray colors expected from the disturbance and pad consticton.
TEX-TURE	Smooth where disturbance has occurred	Smooth from temporary disturbance and jagged from reclaimed vegetation growth.	Smooth

SECTION D. CONTRAST RATING __SHORT TERM ✓LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓				✓
	LINE				✓				✓				✓
	COLOR				✓				✓				✓
	TEXTURE				✓				✓				✓

2. Does project design meet visual resource management objectives? ✓ Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended ___Yes ✓ No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants
Date: 07/21/2020

(Continued on Page 2)

(Form 8400-4)

SECTION D. (Continued)

Comments from item 2.

This project is evaluated as a long-term. The proposed project that goes through the VRM Class IV area will contain permanent aboveground infrastructure. The KOP was identified for proximity of the project to a residential area that would view the proposed infrastructure. Long-term impacts to the view-shed at the KOP would result from the introduction of new human-made elements in the form of a oil/gas well pad, tanks, and a production facility. Give the location of the proposed pad and production facility and the location of the KOP 2 location, aboveground infrastructure cannot be seen. This proposed project would conform to the objective of VRM Class IV management objectives by following the mitigation measures outlined in section 3.6 of the EA.

Additional Mitigating Measures (See item 3)

Save | Print | Clear

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 07/21/2020
District Office: BLM FFO
Field Office: Farmington
Land Use Planning Area: Oil Well

SECTION A. PROJECT INFORMATION

1. Project Name DJR NU 2309-2409 Cluster Project	4. KOP Location (T.R.S) Section 1, T. 24N., R. 9W.	5. Location Sketch See photographs in section 3.6 of the EA
2. Key Observation Point (KOP) Name KOP 3		
3. VRM Class at Project Location Class IV	(Lat. Long) 36.264612°, -107.776550°	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat terrain in foreground, undulating mid to background.	Partial uniformity in background and diffuse blocks from shrubs and trees in mid and background	Overhead power line in foreground. Dirt road in the mid ground.
LINE	Horizontal, small undulation of ridge in the distance.	Curved and undulating in mid and background, smooth foreground	Straight lines from dirt and paved road in mid and foreground.
COLOR	Light brown, yellow-tan, reddish-tan,	Blue-green, yellow-green, slate gray, dark gray/green, tan	Light brown, tan and gray
TEX-TURE	Smooth fore and mid ground.	Coarse mid and foreground, smooth background	Smooth lines

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat forms from the the pad constuction	Short, smooth, undulating lines from temporary disturbance, construction, reclamation and contouring in foreground	Block-like forms from completion of tanks within VRM; upright forms during construction
LINE	Near horizontal from temp disturbance for pad construction and flat horizontal lines post construction.	Straight bladed lines from workspace edges and clear, flat lines were vegetation is removed	Ground and mid range lines.
COLOR	Some tan and gray colors expected from the ground disturbance	Areas of lighter and brighter green where reclamation would occur	Tan and gray colors expected from the disturbance and pad consticton.
TEX-TURE	Smooth where disturbance has occurred	Smooth from temporary disturbance and jagged from reclaimed vegetation growth.	Smooth

SECTION D. CONTRAST RATING __SHORT TERM ✓LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			✓				✓				✓	
	LINE			✓				✓				✓	
	COLOR			✓				✓				✓	
	TEXTURE			✓				✓				✓	

2. Does project design meet visual resource management objectives? ✓ Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended ___Yes ✓ No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants
Date: 07/21/2020

(Continued on Page 2)

(Form 8400-4)

SECTION D. (Continued)

Comments from item 2.

This project is evaluated as a long-term. The proposed project that goes through the VRM Class IV area will contain permanent aboveground infrastructure. The KOP was identified for proximity of the project to a residential area that would view the proposed infrastructure. Long-term impacts to the view-shed at the KOP would result from the introduction of new human-made elements in the form of a oil/gas well pad, tanks, and a production facility. Portions of the proposed project area will be reclaimed with native seed mixture after construction and vegetation is expected to regrow within two years, reducing visual disturbance. The production facility and any large aboveground infrastructure would be camouflaged and concealed to blend into the existing terrain and vegetation. This proposed project would conform to the objective of VRM Class IV management objectives by following the mitigation measures outlined in section 3.6 of the EA.

Additional Mitigating Measures (See item 3)

Appendix L: Biological Resources Compliance Form, Navajo Nation Department of Fish and Wildlife

NNDFW Review No. 19swca102

BIOLOGICAL RESOURCES COMPLIANCE FORM
NAVAJO NATION DEPARTMENT OF FISH AND WILDLIFE
P.O. BOX 1480, WINDOW ROCK, ARIZONA 86515-1480

It is the Department's opinion the project described below, with applicable conditions, is in compliance with Tribal and Federal laws protecting biological resources including the Navajo Endangered Species and Environmental Policy Codes, U.S. Endangered Species, Migratory Bird Treaty, Eagle Protection and National Environmental Policy Acts. This form does not preclude or replace consultation with the U.S. Fish and Wildlife Service if a Federally-listed species is affected.

PROJECT NAME & NO.: Nageezi Units 2309 and 2409 Cluster Oil Wells Projects:

- Nageezi Unit (NU) M35-2409 Nos. 314H, 315H, 316H, 318H, and 319H (NU M35)
- NU G35-2409 Nos. 308H, 309H, 310H, 632H, and 313H (NU G35)
- NU B02-2309 Nos. 305H, 306H, 307H, and 622H (NU B02)
- NU H33-2409 Nos. 633H and 608H (NU H33)

DESCRIPTION: Proposed development of four (4) oil well pad sites: NU M35, NU G35, NU B02, and NU H33. Each site would include the drilling, production, and final abandonment of up to five (5) oil wells. Each of the four well pads would include access roads, pipelines, two G-tank pads, one G-tank access road, two staging areas, and eight TUAs. The proposed development would result in a total of 49.6 acres of new surface disturbance (38.3 acres on BLM FFO surface and 11.3 acres on Navajo Allotted surface).

LOCATION: 1–3 miles W-NW of the community of Nageezi, San Juan County, New Mexico

REPRESENTATIVE: SWCA Environmental Consultants for DJR Operating, LLC

ACTION AGENCY: Bureau of Indian Affairs and Navajo Nation

B.R. REPORT TITLE / DATE / PREPARER: BSR-BE for the Nageezi Units 2309 and 2409 Cluster Oil Wells Projects/APR 2020/SWCA Environmental Consultants

SIGNIFICANT BIOLOGICAL RESOURCES FOUND: Area 3.

POTENTIAL IMPACTS

NESL SPECIES POTENTIALLY IMPACTED: DJR has reduced surface disturbance within the BLM-designated habitat "zone" for ALFO & SCCLBR to the maximum extent practicable.

FEDERALLY-LISTED SPECIES AFFECTED: NA

OTHER SIGNIFICANT IMPACTS TO BIOLOGICAL RESOURCES: NA

AVOIDANCE / MITIGATION MEASURES: NA

CONDITIONS OF COMPLIANCE*: NA

FORM PREPARED BY / DATE: Pamela A. Kyselka/11 JUN 2020

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COPIES TO: (add categories as necessary)

☐ _____ ☐ _____

2 NTC § 164 Recommendation: Signature Date

☒Approval
☐Conditional Approval (with memo)
☐Disapproval (with memo)
☐Categorical Exclusion (with request letter)
☐None (with memo)

6/11/20

Gloria M. Tom, Director, Navajo Nation Department of Fish and Wildlife

*I understand and accept the conditions of compliance, and acknowledge that lack of signature may be grounds for
the Department not recommending the above described project for approval to the Tribal Decision-maker.

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